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ABSTRACT

One of a series of eleven curriculum manuals which cover the four transportation topics of public transportation, transportation and the environment, transportation safety, and bicycles for elementary, secondary, and adult levels, this manual covers the transportation and the environment topic for grades 6-9. It contains thirty-nine learning activities grouped into seven mini-units. Each mini-unit consists of a lesson plan component, which provides a suggested sequence of learning activities, and an individual learning activities component, which describes in detail how to implement each exercise. The first mini-unit provides a survey of issues related to transportation and the environment; the rest are as follows: learning about the interrelations between transportation and the environment, learning about the automobile's effects on the environment, identifying solutions to conflicts between transportation and the environment, taking personal action to resolve conflicts between transportation and the environment, exploring how citizen participation can help resolve conflicts between transportation and the environment, and researching issues related to transportation and the environment. A final section offers additional activities that may be used to evaluate or supplement evaluation of an activity or mini-unit. Also included are references for further study resources, and for reproduction of role profiles, game boards, maps, and other distributable materials. (A curriculum guide, CE 014 028, is also available for use with the manuals.) (TA)

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TRANSPORTATION AND THE ENVIRONMENT IN HARMONY

MINI-UNITS AND LEARNING ACTIVITIES

for

grades 6 through 9

by

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Abt Publications
1977

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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FOREWORD

TEACHING TRANSPORTATION: AN OVERVIEW

> Nearly everything Americans do, from mailing a postcard to walking on the moon, depends on transportation. Transportation is essential for the supply of food, clothing and shelter, for national defense and employment, for education and recreation, for the international exchange of goods and services.*

While every American is provided with the necessities and amenities of modern life through an intricate freight-carrying network, we think of transportation most readily in terms of moving people, not products, and for good reason. Millions of us commute to work every day by car, bus, train, or subway. Moreover, 21 million youngsters travel on school buses every day. Americans use a variety of transportation modes for other purposes, including shopping, recreation, tourism, and moving. The average family changes residence once every five years and makes use of one of the many thousands of for-hire companies that provide domestic surface transportation. In addition, Americans travel more than 1.7 trillion miles by passenger cars or trucks every year, while 250 trains cover 26,000 miles and service 484 communities, with more than 7 million people annually using the New York to Washington run alone. There are also 950 intercity bus companies whose 20,600 vehicles travel 1.1 billion miles each year, while commercial aircraft transport over 210 million passengers annually.

Americans are highly dependent on transportation services for recreation purposes, too. Not only are vehicles used to get to places of entertainment, many vehicles are themselves forms of recreation. For example, there are approximately 7.3 million registered boats in the country, not counting rowboats and canoes. Seven and one-half million motor homes, truck campers, and travel and camping trailers are on the roads. Snowmobiles, dune buggies, and home-built vehicles have become widespread in the past few years.

Americans also relax on two-wheeled vehicles: there are 100 million bicycles and nearly five million motorcycles in the country, many of which are used for commuting as well as recreation.

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*John Burby, *The Great American Motion Sickness*, Little, Brown and Co., (Boston: 1971), page 3.

The most frequently used form of transportation in the nation, however, is walking. We sometimes forget that pedestrians utilize the single most common mode of travel.

Finally, the overwhelming importance of transportation in our lives must be assessed not only in terms of movement of goods and people, but also in relation to the millions of jobs transportation provides. Transportation facilities and vehicles require manufacturers, builders, operators, and mechanics, while they also create thousands of employment opportunities in related industries, from foundries which produce steel for vehicles to insurance companies which provide automobile insurance to health care systems which treat travel-related injuries.

For all these reasons it is important for students to become aware of transportation as it affects their lives, to learn to be wise purchasers and users of transportation goods and services, and to develop skills to promote constructive use and appropriate expansion of all forms of transportation in their communities and beyond.

In particular, consumers should become informed about (1) improving and using public transportation, (2) harmonizing transportation and the environment, (3) understanding transportation safety, and (4) perceiving the importance of bicycling. By examining these four major topics, students will learn, for example: to identify the best methods for commuting to school and work; to travel, when possible, in ways which minimize adverse transportation effects on the environment; and to purchase and use transportation vehicles and facilities within the safest possible manner.

CURRICULUM MATERIALS AVAILABLE

This Manual is one in a series of volumes which treat the four transportation topics of Public Transportation, Transportation and the Environment, Transportation Safety, and Bicycles at different grade levels. These volumes were developed by Abt Associates Inc. under contract to the U.S. Department of Transportation, Office of Consumer Affairs. The following eleven Manuals and curriculum guide on transportation consumer education are currently available:

- TRAVEL ON! Mini-units and Learning Activities on Transportation for Grades K-3
- TRAVEL ON! Mini-units and Learning Activities on Transportation for Grades 4-6
- Transportation Consumer Education for Adults: Mini-units and Learning Activities
- PEDAL ON! Mini-units and Learning Activities on Bicycling for Grades 6-9
- PEDAL ON! Mini-units and Learning Activities on Bicycling for Grades 9-12
- RIDE ON! Mini-units and Learning Activities on Public Transportation for Grades 6-9
- RIDE ON! Mini-units and Learning Activities on Public Transportation for Grades 9-12
- GETTING THERE! Mini-units and Learning Activities on Transportation Safety for Grades 6-9
- GETTING THERE! Mini-units and Learning Activities on Transportation Safety for Grades 9-12
- Transportation and the Environment in Harmony: Mini-units and Learning Activities for Grades 6-9
- Transportation and the Environment in Harmony: Mini-units and Learning Activities for Grades 9-12
- Transportation Consumer Education: A Curriculum Guide for Grades K-12 and Adult

These volumes may be ordered from

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Cambridge, Massachusetts 02138

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The Federal Highway Administration (FHWA)

The National Highway Traffic Safety Administration (NHTSA)

The U.S. Office of Education, Bureau of Occupational Education (USOE/BOE)

The Office of Environmental Affairs in the Department of Transportation

The Urban Mass Transportation Administration (UMTA)

The Federal Aviation Administration (FAA)

The United States Coast Guard

Many individuals within these agencies were very helpful in pointing out biases in the materials, errors of fact, and pedagogical weaknesses.

Despite the considerable assistance from these sources, only the authors are in any way responsible for errors, approaches, and biases in the final product.

Antonina Uccello, Director of the Office of Consumer Affairs in the U.S. Department of Transportation, who was responsible for this project, actively and very helpfully involved herself in it from beginning to end. Finally, we are happy to allocate a large share of the credit for the Manual to the constant availability, assistance, and suggestions of the two Contract Technical Monitors for the project, Lee Learner Gray and Marilee Cavender.

INTRODUCTION

WHAT'S IN THE MANUAL

Transportation and the Environment in Harmony, Grades 6-9, contains 39 learning activities grouped into 7 mini-units. Each unit has two components:

1. *A lesson plan* which provides a suggested day-by-day sequence of learning activities and goals
2. *Individual learning activities* which describe in detail how to implement the exercises suggested in the lesson plan

Seven spirit masters are also provided at the end of the Manual for use with eight different activities.

The first mini-unit provides a survey of issues related to transportation and the environment, while the rest focus on a specific aspect of transportation and the environment. The six activities in the survey mini-unit all reappear in subsequent units. Brief descriptions of all the activities in the Manual are provided on pages 11 and 12.

The last section of activities consists of exercises which may be conducted independently. The final activity is a quiz which may be used to supplement or substitute for the evaluation method provided in each activity.

Also included at the end of the volume is a bibliography of suggested teacher and student materials.

HOW TO USE THE MANUAL

This Manual is designed as a resource volume of activities and background materials to be used in ways which are compatible with your needs and those of your students.

The mini-units and individual learning activities may be integrated into your curriculum at many points and to meet many purposes.

- In *consumer education and home economics,* the activities find a natural home in view of their treatment of transportation issues from the perspective of the consumer.
- In *social studies,* the activities enhance learning about one's community. They aid in understanding the importance of citizen participation in government, and they broaden the study of transportation itself.

- In *science*, the activities have a place because of the effect that transportation has on the environment.
- *Health and safety units* are obvious points of entree because of the Manual's emphasis on pollution of the environment.
- *Language arts* skills are integral to all the mini-units, since the activities are designed to develop and reinforce students' capacities to listen, speak, write, observe, and analyze.

You will find that the introduction to each mini-unit sums up the rationale for teaching that topic in your classroom. After reading these mini-unit instructions, you will have the background for deciding which mini-unit or mini-units you will teach. In examining the mini-units, you should feel free to make substitutions or deletions in the mini-units and in the learning activities whenever this is necessary to meet your teaching objectives.

Here are several methods for adapting the mini-units and learning activities to teach transportation and the environment in your classroom.

You can read the lesson plans for all mini-units and *select one or more lesson plans* to integrate into your course. Having made your selection, read the detailed activity descriptions which follow the lesson plans for specific instructions on implementing the activities in the mini-unit or units you have chosen. This method of using the Manual is most appropriate if you wish to concentrate in some depth on one or more specific aspects of transportation and the environment.

If you prefer to provide your students with a survey of issues related to transportation and the environment touching on several aspects of the field, you can *implement the first mini-unit* which provides just this type of overview. For your own information, you may wish to skim the lesson plans of the other mini-units for additional materials that will enrich your survey presentation.

You can *develop your own mini-unit* consisting of activities that you select from several mini-units in the Manual.* If you wish to do this, read the capsule descriptions of each activity provided on the chart on the following pages. This chart will show you, at a glance, the teaching method and content of each learning activity offered in the Manual.

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*You can also have your students leaf through the activities and select ones they would like to pursue individually or in small study groups.

MINI-UNITS AND ACTIVITIES

Mini-unit 1

Surveying issues related to transportation and the environment

Activity #	Activity Description	Class Time (periods)
1	Students define the field of study, "Transportation and the Environment."	½-1
2	Students identify the major effects transportation has on the environment and ways in which features of the environment sometimes affect travel.	½-1
3	Students play a board game that reviews potential beneficial and harmful environmental consequences of different modes of transportation.	½-1
4	Students discuss what actions private citizens can take in their personal travel behavior to reduce the harmful effects of automobile use on the environment.	½-1
5	Students discuss and evaluate actions the government is taking to reduce transportation's harmful effects on the environment.	½-1
6	Students discuss kinds of citizen participation the public can engage in to balance the needs of transportation and the environment.	1
	Mini-unit 2	
	Learning about the interrelationships between transportation and the environment	
7	Students identify the major effects transportation has on the environment and ways in which features of the environment sometimes affect travel.	½-1
8	Students take field trips to place themselves in the position of people experiencing transportation's beneficial and harmful effects.	1½-2
9	Students take field trips to identify and classify pleasant and unpleasant noises associated with transportation vehicles and facilities.	½-1
10	Students discuss ways in which features of the environment can create obstacles which interfere with travel safety, convenience, and enjoyment.	½-1
11	Students play a board game that reviews potential beneficial and harmful environmental consequences of different modes of transportation.	½-1
	Mini-unit 3	
	Learning about the automobile's effects on the environment	
12	Students discuss the automobile's beneficial and harmful effects on the environment.	½-1
13	Students engage in one or more scientific experiments that illustrate the harmful effects of automobiles on the environment.	½-2
14	Students discuss the automobile's indirect effects on the environment.	½-1
15	Students identify the beneficial effects highways and roads have on the environment by evaluating a local highway or road in these terms.	½-1
	Mini-unit 4	
	Identifying solutions to conflicts between transportation and the environment	
16	Students plan and defend the building of a new commercial airport in their community.	2-4
17	Students discuss and evaluate actions the government is taking to reduce transportation's harmful effects on the environment.	½-1
18	Students discuss one or more solutions to conflicts between transportation and the environment.	½-1
19	Students discuss when to engage in citizen participation to oppose a harmful transportation effect on the environment or a feature of the environment which interferes with travel.	1
	Mini-unit 5	
	Taking personal action to resolve conflicts between transportation and the environment	
20	Students discuss what actions private citizens can take in their personal travel behavior to reduce the harmful effects of automobile use on the environment.	½-1
21	Students discuss America's alleged "love affair" with the automobile and how this may have affected patronage of public transportation.	½-1
22	Students examine their own attitudes toward changing their travel habits in ways which will reduce transportation's harmful effects on the environment.	½-1
23	Students discuss when it is appropriate to object to someone's use of transportation when it has detrimental effects on the environment.	½-1
24	Students role play scenarios in which one person complains to another that his or her travel behavior is having harmful environmental effects.	1

MINI-UNITS AND ACTIVITIES (cont.)

Mini-unit 6

Explaining how citizen participation can help resolve conflicts between transportation and the environment

Activity #	Activity Description	Class Time (periods)
25	Students discuss kinds of citizen participation the public can engage in to balance the needs of transportation and the environment.	1
26	Students discuss when to engage in citizen participation to oppose a harmful transportation effect on the environment or a feature of the environment which interferes with travel.	1
27	Students discuss what kinds of citizen participation the public can engage in to reduce transportation's harmful effects on the environment in their own community.	1
	Mini-unit 7	
	Researching issues related to transportation and the environment	
28	Students take field trips to different agencies and individuals to learn about transportation's effects on the environment.	2-3
29	Students poll the public on its knowledge about and attitudes toward conflicts between transportation and the environment.	2-4
30	Students research other transportation modes as personal travel alternatives to automobiles.	2-3
	Supplementary activities	
31	You and your students evaluate class interests in studying transportation and the environment.	½-1
32	Students develop and play word games using transportation and environmental terms and concepts.	½-2
33	The class discusses the beneficial ways in which aircraft are used in relation to the environment.	½-1
34	Students create collages illustrating beneficial and harmful effects transportation vehicles and facilities can have on the environment.	2-3
35	Students discuss what individuals can do to persuade others to reduce transportation's harmful effects on the environment.	1
36	Students discuss actions individuals can take to avoid transportation's harmful effects on the environment that affect these same individuals personally.	1-2
37	Students evaluate the course.	½-1
38	You and your students evaluate student attitudes towards issues related to transportation and the environment.	½-1
39	Students respond to written and oral questions about issues related to transportation and the environment.	½-1

WHY TEACH ABOUT TRANSPORTATION AND THE ENVIRONMENT*

The Problems

American consumers are the purchasers and users of personal transportation goods and services amounting to nearly 124 billion dollars every year.

Transportation and the environment are in many respects in a state of conflict. Transportation vehicles and facilities cause damage to the environment:

- The motor vehicle is still a major pollutant of our air, even with improvements in the control of auto emissions.
- Heavy traffic congestion clogs roads and city streets (77 percent of the nation's workforce commutes to work every day by private automobile; more than 70 percent of these people drive alone).
- Eighteen percent of the nation's energy supply is consumed by motor vehicle transportation; and nearly 80 percent of this amount is for personal travel by car, truck, or bus. (Early 1976 figures indicated an increase in vehicle fuel consumption, reverting to patterns that had been prevalent before 1974 and 1975 when Americans reduced the vehicle fuel consumption in response to the immediate fuel crisis.)
- Motor vehicle use is responsible for much of the visual pollution of our countryside--billboards, litter, automobile junkyards, as well as many badly designed gas stations, parking lots, and bus stations.

Transportation vehicles and facilities also enhance or preserve the environment in numerous ways and make scenic areas more accessible to the public. These beneficial effects must be balanced against the damage transportation causes to the environment.

It must be remembered that the environment, in turn, can interfere with transportation.

- Natural obstructions to visibility, confusing traffic signs, and poorly designed roads are obstacles that hamper travel safety, comfort, and convenience.

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*For the purpose of this Manual we have defined "environment" broadly to include a wide variety of factors that interact with travel, including natural resources, residential patterns, land space, and visual obstructions. The concept includes both the natural environment and the man-made environment.

We must work to bring transportation and the environment into balance with one another by shifting emphasis from environmentally damaging forms of transportation to modes of travel which do not harm the environment unnecessarily.

The Solutions

The solutions depend on

- Federal and state governments--to promote balanced transportation by providing assistance for planning, development, and financing of improved transportation systems; to enact legislation which will lessen conflicts between transportation and the environment; and to encourage private industry to develop and promote vehicles that are more energy efficient and less polluting
- Local transit authorities--to generate greater use of their services by making public transportation more accessible and attractive to the daily traveler
- Citizens/consumers--to become informed about national and local transportation and environmental problems and participate in their solution by individual personal actions and by community involvement
- Classroom teachers--to guide students to a better understanding of the causes and effects of transportation and environmental problems, and of possible solutions. Transportation consumer education can offer the student a unique opportunity to develop awareness and skills essential to acquire responsible transportation and environmental habits and to play a role in balancing the often conflicting needs of transportation and the environment in the community

This Manual

This manual focuses on developing consumer skills that are particularly appropriate to grades 6-9. The learning activities are designed to help do this.

- They stimulate students' awareness and understanding of *transportation and environmental issues*.
- They teach about the *effects*--both good and bad--transportation vehicles and facilities have on the environment.

- They teach about the ways in which features of the *environment* can sometimes hamper safe, convenient, and enjoyable *travel*.

- They teach about the unique effects *automobiles* have on the environment--both harmful and beneficial.

- They help students to realize that *people who do not drive*--like themselves--nonetheless benefit from and are harmed by transportation vehicles and facilities.

- They encourage students to start thinking *at an early age* about their attitudes toward automobiles and other modes of travel so that when they get their drivers' licenses they will use cars in ways which minimize damage to the environment.

- They promote the ability to *identify resolutions to conflicts* between transportation and the environment.

- They stimulate students to consider *taking actions* as youngsters to help resolve conflicts between transportation and the environment.

- They stimulate students to develop the necessary skills and information to be able to take personal actions and engage in *citizen participation* later as adults to help promote harmony between transportation and the environment.

MINI-UNITS
AND
LEARNING ACTIVITIES

MINI-UNIT 1

SURVEYING ISSUES RELATED TO TRANSPORTATION AND THE ENVIRONMENT*

This first mini-unit is designed for instructors who may not have the time to devote to two or three of the more in-depth mini-units which follow and instead want to expose their students to a variety of issues related to transportation and the environment. This unit can also be used in conjunction *with* or as an introduction to one or more of the following units.

The unit focuses on two major issues associated with balancing the frequently conflicting needs of transportation and the environment:

1. Transportation's beneficial and harmful *effects* on the environment
2. *Actions* citizens can take to reduce those harmful effects

Major concepts treated in the unit include

- The field of transportation and the environment has several aspects, including ways in which use of transportation harms the environment; ways in which use of transportation benefits the environment; and ways in which the environment creates obstacles that interfere with the safety, convenience, or enjoyment of travel.
- The concept of "transportation" includes not only vehicles but also the facilities, such as highways and airports, which are needed to service vehicles.
- There are several positive actions the public can take which will help reduce pollution and depletion of scarce energy resources resulting from excessive use of automobiles.
- Citizens need to be aware of the government's attempts to balance the needs of transportation and the environment in order to evaluate them and encourage the government to alter or expand its efforts in this direction.
- Citizens need to decide for themselves when it is appropriate to engage in citizen participation to promote harmony between transportation and the environment.

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*The activities in this mini-unit are all selected from the other mini-units which follow.

You can, of course, browse through the activities in the other mini-units and substitute one or more of them for those we have provided in this initial survey unit. You may find activities which are more appropriate to the needs of your particular students than the ones this unit recommends.

MINI-UNIT 1 LESSON PLAN

Surveying issues related to transportation and the environment

Activity #	*Activities*	*Class Time*
1	DESCRIPTION: Students define the field of study, "Transportation and the Environment." GOAL: To be aware of what the field of transportation and the environment encompasses.	½-1 period
2[a]	DESCRIPTION: Students identify the major effects transportation has on the environment and ways in which features of the environment sometimes affect travel.[a] GOAL: To know how transportation vehicles and facilities and the environment interact in positive and negative ways.	½-1 period
3[a] Spirit Masters #1a, #1b, #2	DESCRIPTION: Students play a board game that reviews potential beneficial and harmful environmental consequences of different modes of transportation.[a] GOAL: To know some of the beneficial and harmful effects transportation has on the environment.	½-1 period
4[b]	DESCRIPTION: Students discuss what actions private citizens can take in their personal travel behavior to reduce the harmful effects of automobile use on the environment.[b] GOAL: To know what actions individuals can take in their personal travel behavior to reduce the adverse effects of automobiles on the environment.	½-1 period

[a] This activity also appears in Mini-unit 2.

[b] This activity also appears in Mini-unit 5.

MINI-UNIT 1 LESSON PLAN (CONTD.)

Surveying issues related to transportation and the environment

Activity #	*Activities*	*Class Time*
5[a]	DESCRIPTION: Students discuss and evaluate actions the government is taking to reduce transportation's harmful effects on the environment.[a] GOAL: To know how the government is attempting to balance the needs of transportation and the environment.	½-1 period
6[b] Spirit Master #3	DESCRIPTION: Students discuss kinds of citizen participation the public can engage in to balance the needs of transportation and the environment.[b] GOAL: To know what types of citizen participation the public can engage in to promote harmony between transportation and the environment.	½-1 period

[a]This activity also appears in Mini-unit 4.

[b]This activity also appears in Mini-unit 6.

Total Class Time: 3½-6 periods.

ACTIVITY #1

Mini-unit Topic: Surveying the Field **Approximate Class Time:** ½-1 period

Capsule Activity Description: Students define the field of study, "Transportation and the Environment."

Goal:

To be aware of what the field of transportation and the environment encompasses.

Concepts Treated:

- The field of transportation and the environment has several aspects, including ways in which use of transportation harms the environment; ways in which use of transportation benefits the environment; and ways in which the environment creates obstacles that interfere with the safety, convenience, or enjoyment of travel.
- The concept of "transportation" includes not only vehicles but also the facilities, such as highways and airports, which are needed to service vehicles.

ACTIVITY

Begin the activity by indicating that different people probably have different ideas in mind when they refer to "transportation and the environment" and that if the class is to study this topic it has to agree on what this field of study constitutes. Ask students for definitions of the words "transportation" and "environment." For example, "transportation" might be defined as

> the process of moving people and products, including the vehicles used for carrying them *and* the facilities necessary to service these vehicles (such as gas stations, highways, and airports).

"Environment" might be defined as

> all the man-made and natural objects and conditions which can affect and be affected by transportation, including energy resources, pollution, and land use.

Following this definitional exercise, indicate that the benefits transportation has conferred on society have been striking. (Refer to the Manual Introduction where these benefits are enumerated.) Then point out that some of these benefits have included enhancing the environment and making it possible for citizens to appreciate the environment, from cleaning up garbage to providing access to wilderness areas.

Indicate that transportation has also had harmful effects on the environment, and it is primarily these deleterious consequences which make a study of the field of transportation and the environment so important.

Move on to stress that a study of the relationship between transportation and the environment also includes research into ways in which some features of the environment can hamper transportation safety, ease, and pleasure--as, for example, when overhanging trees obscure visibility for automobile and truck drivers.

Conclude the activity by discussing how a narrow definition of "transportation and the environment" may deter society from reducing transportation's harmful effects on the environment and eliminating features of the environment which hamper travel safety, comfort, or convenience. For example, it is difficult for people to rectify a problem if they don't recognize it as a problem because they haven't defined it as such.

Evaluation Method:

Students describe the components of the field of transportation and the environment.

ACTIVITY #2*

Mini-unit Topic: Surveying the Field **Approximate Class Time:** ½-1 period

Capsule Activity Description: Students identify the major effects transportation has on the environment and ways in which features of the environment sometimes affect travel.*

Goal:

To know how transportation vehicles and facilities and the environment interact in positive and negative ways.

Concepts Treated:

- Transportation has significant effects on the environment.
- Some of transportation's effects on the environment are beneficial while others are harmful.
- The environment can create conditions which facilitate or hamper travel safety, convenience, and enjoyment.

ACTIVITY

Students indicate what they believe the major ways are in which (1) use of transportation vehicles affect the environment and (2) how features of the environment may affect travel safety, comfort, and convenience. List these on the blackboard.

After students have exhausted their ability to identify effects, you can check their efforts against the following:

1. Examples of transportation's harmful effects on the environment are air pollution, noise pollution, visual unsightliness, water pollution, litter, land misuse, energy consumption and depletion, displacement of people and business, and solid waste disposal problems of junk.

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*This activity also appears in Mini-unit 2.

2. Examples of how use of transportation can benefit the environment are: reducing stop-and-go traffic, providing access to parks, historic sites, natural environment areas, etc., fighting forest fires, crop spraying, facilities for viewing scenery, garbage collection, airlifting food to stranded livestock, forest seeding and fertilizing, weather control, insect control, pollution monitoring, and visual attractiveness.

3. Examples of how the environment creates obstacles which interfere with travel safety, enjoyment, or convenience: litter, commercial signs, obstacles to clear vision (trees, curves, etc.), garbage dumps, and automobile junkyards.

Conduct a follow-up discussion on *why* students may have failed to mention all these effects. For example:

- As adolescents or young teenagers who do not yet drive, are they unaware of these effects, not having had personal experience with them?
- Did they neglect to mention the energy shortage as it relates to transportation because they felt there was nothing they could do about it?
- Did they fail to mention noise pollution from vehicles because they live in a rural area?
- Are they unaware of how significantly noise affects some people?
- Did they fail to mention attractive scenery and natural environment areas made accessible by highways and vehicles because students do not think in terms of transportation's positive effects on the environment?
- Did they fail to note how freeways in cities, to the extent that they draw off traffic from city streets, reduce pollution by limiting stop-and-go traffic because the students have never realized that highways can reduce pollution?
- Did they fail to mention forest seeding and fertilizing from airplanes because they live in urban areas and are unfamiliar with farming and forestry practices?

Evaluation Method:

Students describe the major ways in which transportation vehicles and facilities and the environment interrelate for good and ill.

Variation and Supplementary Activity

Students can identify and classify pleasant and unpleasant noises associated with transportation vehicles and facilities by keeping a log of the sounds they hear emanating from transportation sources, such as sirens, horns, engines, car tire squealings, and accidents. See Activity #9.

Students can identify and discuss the beneficial ways in which aircraft are used in relation to the environment. One of the sections in Chapter III of this Manual, "Readings on Transportation and the Environment," addresses this issue.

ACTIVITY #3*

Mini-unit Topic: Surveying the Field

Approximate Class Time: ½-1 period

Capsule Activity Description: Students play a board game that reviews potential beneficial and harmful environmental consequences of different modes of transportation.*

Goal:

To know some of the beneficial and harmful effects transportation has on the environment.

Concept Treated:

- Transportation vehicles have both beneficial and harmful effects on the environment.

ACTIVITY

Students exercise their knowledge of transportation's effects on the environment by playing a simple board game. Materials required include a small gameboard (provided on Spirit Masters #1a and #1b), a set of cards for each player (provided on Spirit Master #2), and a die for each group of players.

Divide the class into small groups of three or four students. Each group is given a set of game materials. The first time the game is played, students cut out their own transportation effects cards and paste the "game board" onto cardboard for durability. Each group will need a die to determine the number of boxes to move on the board. Instructions for playing the game appear on the "game board."

Evaluation Method:

Game is self-evaluating.

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*This activity also appears in Mini-unit 2.

ACTIVITY #4*

Mini-unit Topic: Surveying the Field

Approximate Class Time: ½-1 period

Capsule Activity Description: Students discuss what actions private citizens can take in their personal travel behavior to reduce the harmful effects of automobile use on the environment.*

Goal:

To know what actions individuals can take in their personal travel behavior to reduce the adverse effects of automobiles on the environment.

Concepts Treated:

- There are several positive actions the public can take which will help reduce pollution and depletion of scarce energy resources resulting from excessive use of automobiles.
- Citizens need to pinpoint actions they can take that are most beneficial to the environment in reducing automobile pollution.
- Youngsters need to consider whether adolescents their age who cannot yet drive have a role to play in reducing the harmful effects of automobiles on the environment.

ACTIVITY

Students write their response to the scenario below:

The Mayor has just appointed you Commissioner of Transportation and the Environment for your community. He has asked you to come up with a plan of action that lists the *actions individual citizens can take to (1) reduce the effects of auto emissions on the environment and (2) reduce the extent to which cars use up energy resources.* The Mayor wants you to include in your report things young teenagers can do to help solve this problem.

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*This activity also appears in Mini-unit 5.

You have ten minutes right now in which to write a list of recommendations.

Break the class into small groups, instructing the members of each group to read each other's lists and discuss

1. Which actions you agree most citizens will voluntarily undertake and *why* you believe citizens would do so

2. Which actions citizens could be motivated to undertake, and *how* they could be motivated to do so

3. Which actions, if any, young teenagers could be motivated to undertake, and how they could be motivated to do so

4. Why some citizens will not take any action

Groups report conclusions to the class and respond to questions and comments from you and the other groups. Raise for discussion any actions that students may have ignored:

1. Use public transportation whenever possible.

2. Use carpools and bicycles--and walk.

3. Maintain a car in optimum emission-reducing condition.

4. Use good driving habits, avoiding unnecessary emission-producing maneuvers (see the suggestions listed at the end of the activity).

5. Buy unleaded gasoline.

6. Buy cars with the lowest levels of emissions.

Evaluation Method:

Students describe the actions private citizens can take in their personal travel behavior which will help reduce the harmful effects of excessive automobile use on the environment and indicate why these actions will be effective.

GETTING THE BEST MILEAGE FROM YOUR GASOLINE

After you have selected the gasoline with the octane rating and the additives you need you can take several precautions to improve performance and save gasoline.

First, to improve performance

- Shop for a good mechanic. Check your friends and neighbors to see if they know one who is a specialist on your car.

- If you have your car serviced at a large agency, get acquainted with the service manager and see if you can have the same mechanic service your car every time.

- Follow the recommendations in your Owner's Manual for major and minor service and tune-ups.

Second, to save gasoline and conserve energy:

- Check your tire pressure at least once every month. Too low tire pressure increases rolling resistance, causes increased tirewear and reduces gasoline mileage.

- Periodically have your mechanic check the treadwear pattern of your tires to see if they are properly aligned. If they are out of alignment, the tires will wear excessively and your gasoline mileage will drop.

- If possible, avoid pressing your accelerator all the way down when climbing hills and long grades. It wastes gasoline.

- Avoid excessive high speed or jerky driving; learn to drive as smoothly and steadily as traffic and road conditions allow.

- Turn off your engine if you stop more than a minute. Restarting uses less gasoline than a minute's idling.

- Use the brake rather than the accelerator to hold your car in place on a hill.

- Jumpy starts and fast getaways can burn over 50 percent more gasoline than normal acceleration.

- Avoid weaving, spurting and lane changing in heavy traffic. Such practices waste fuel.

- Look ahead and pace yourself to minimize stops at traffic lights and jam-ups.

- Slow down. Excessive speed is the greatest waster of gasoline. For best mileage do not exceed 50 miles per hour.

- Limit the use of auto air conditioners and other fuel consuming accessories.

- If you get a sudden drop in gasoline mileage, check with your mechanic. Trouble is brewing, and the sooner you have it fixed the less it is likely to cost you.

- Before you buy a new car, ask the dealer how many miles per gallon you can expect. These figures are now available for most models.

- Reduce the number of unessential auto trips through careful trip planning.

- Use mass transit, carpools or bicycles when feasible.

ACTIVITY #5*

Mini-unit Topic: Surveying the Field

Approximate Class Time: ½-1 period

Capsule Activity Description: Students discuss and evaluate actions the government is taking to reduce transportation's harmful effects on the environment.*

Goal:

To know how the government is attempting to balance the needs of transportation and the environment.

Concepts Treated:

- A major solution to conflicts between transportation and the environment lies in government action to resolve such problems.
- The government is already attempting to balance the needs of transportation and the environment.
- Citizens need to be aware of the government's attempts to balance the needs of transportation and the environment in order to evaluate such actions and encourage the government to alter or expand its efforts in this direction.

ACTIVITY

1. Present examples of actions the Federal government is taking to reduce transportation's harmful effects on the environment, such as encouraging less reliance on automobile through carpooling and emphasis on mass transit.

Federal assistance for mass transportation began in 1961 with an emergency loan program and a small test and demonstration program. In 1965 the Urban Mass Transportation Act established a program of Federal matching grants for preservation, improvement and expansion of public transportation systems. Amendments to this Act have provided broader program goals, higher funding levels, longer periods of assured Federal assistance

*This activity also appears in Mini-unit 4.

and greater flexibility in meeting local needs. Funding increased from 50.7 million dollars in 1965 to 133 million dollars in 1970 to over 1.4 billion dollars in 1976 for the purchase and construction of mass transportation facilities.

The Federal-aid Highway Act of 1973 granted flexibility in the use of highway funds for public transportation purposes by opening Urban System funds (previously targeted solely for highways) to transit, both rail and bus; and by opening all highway funds to exclusive lanes for buses, traffic control devices, bus shelters, parking facilities, etc. In addition, interstate highway funds were also made available for nonhighway public transportation purposes under certain conditions.

Significant steps toward rehabilitating the nation's rail system are now being taken as the result of new legislation providing 6.4 billion dollars in Federal aid to railroads. Key features in the law are the following provisions:

- Seven bankrupt Northeast and Midwest railroads are reorganized into the Consolidated Rail Corporation (ConRail), a freight railroad in which the Federal government is authorized to invest. The law provides 2.1 billion dollars for the start-up of ConRail.

- The Department of Transportation will upgrade rail passenger service in the Northeast Corridor. The five-year program will cost 1.75 billion dollars and will include improvements in tracks, stations, bridges, tunnels, signalling, and traffic control. In addition, there will be an expanded program of converting from diesel engines to electric engines; this will reduce pollution and save energy.

- A two-year program of subsidies is provided for bankrupt freight and commuter branch lines in the Northeast and Midwest. Without this subsidy program, these bankrupt lines could be discontinued because the new legislation has not made them part of ConRail. This provision offers 100 percent Federal financing for the first year of the subsidy and 90 percent for the second year.

- Another Federal program of assistance to branch lines is also established by the law, for a five-year period. This funding will be available to all states for the purchase or acquisition of bankrupt lines. This provision offers financing ranging from 100 percent for the first year to 70 percent for the fourth and fifth years.*

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*A fact sheet presenting full details on all provisions of the Railroad Revitalization and Regulatory Reform Act of 1976 is available from Office of Public Affairs, Federal Railroad Administration, Washington, D.C. 20590.

Other measures taken by the Federal government include enacting noise control legislation to reduce excess noise from snowmobiles, trucks and airplanes and supporting and funding highway beautification projects.*

2. Then give specific examples of programs the government is undertaking or has completed which are designed to achieve these objectives, such as:

Grants to cities, towns, and counties for the purchase of public transportation vehicles, such as buses--for example, a grant of 474,852 dollars to the County of Hawaii to assist in the purchase of ten new passenger buses, bus signs, and related equipment.

Grants and contracts to organizations to research the feasibility of a variety of energy-saving and environment-protecting modes of travel--for example, an award of 150,000 dollars to the Massachusetts Institute of Technology to provide research on control procedures for Dial-A-Ride, in which people phone the bus system requesting the bus stop at their house.

Surveys to learn how transportation facilities and vehicles can reduce negative effects on the environment--for example, a survey to determine the potential for increasing transportation energy conservation by strengthening international cooperative research programs. This is an attempt to learn from nations that long ago adjusted to the problem of a limited energy supply ideas that may be applicable in the United States. Interviews have been conducted with officials in France, West Germany, Sweden, Switzerland, and England.

Conferences in which national experts or officials gather to discuss solutions for some of transportation's harmful effects on the environment--for example, a national conference that was held on the railroad's role in meeting the nation's energy requirements. The two-day meeting brought together members of both public and private interest groups as well as the academic community.

Guidelines and requirements for industry prescribing certain behaviors that will reduce transportation's effects on the environment--for example, the Federal Aviation Administration has recommended new ground operating procedures for jets at airports to reduce engine emissions and conserve fuel. It recommended that four-engine jets shut down one or two engines while taxiing to the terminal after landing or during protracted holds before takeoff. Three-engine jets would shut down one engine.

Passage of legislation limiting some of transportation's harmful effects on the environment--for example, a law requiring the installation of emission control devices on automobile exhausts and another reducing the speed limit to 55 mph. (Some of the other laws the government has passed that are designed to reduce transportation's harmful

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*See Chapter III in this Manual, "Readings on Transportation and the Environment."

effects on the environment are discussed in Activity #63 and in the readings.) In another example, the Refuse Act of 1899 prohibits the throwing, discharging, or depositing of any refuse matter into the waters of the United States to a distance of three miles from the coastline. The Federal Water Pollution Control Act prohibits the discharge of oil or hazardous substances into the waters of the United States to twelve miles off shore. And boaters are required by law to notify the U.S. Coast Guard if their vessel or facility discharges oil or hazardous substances into the water.

Demonstration projects which the government funds to learn about the feasibility of methods for reducing transportation's harmful effects on the environment--for example, a 600,000-dollar carpool demonstration project in Los Angeles in which a computer program will provide computer-printed match lists to interested persons within a five-county area who fill out an application form. The project's goal is to remove 888,000 vehicles traveling the highways each day, save 170 million gallons of gasoline a year, and reduce by 71,000 tons the amount of pollutants put into the air each year in the Los Angeles area.

Efforts to reduce the effects of and amount of noise pollution, for example:

- Passage of the Occupational Health and Safety Act which establishes a framework for regulating any and all workplace hazards including excessive noise exposure. Under this act, the Department of Labor and the Department of Transportation have both established regulations for drivers of commercial vehicles in terms of hours of service and noise levels generated by the vehicles at the operator station. For example, certain regulations pertain to the use of hearing protection devices for ground crews around military and commercial aircraft.

- Public Law 90-411 authorizes the Federal Aviation Administration to establish noise standards for aircraft. Such standards have been issued for a variety of new aircraft, resulting in quieter wide-body aircraft such as the 747, DC-10 and L-1011 plus the development of quieting kits for existing aircraft such as the 727, 737, DC-9, DC-8 and 707. Regulations are also being established (1974) to regulate ways in which all aircraft are to operate in the vicinity of airports to reduce noise exposure to adjacent communities.

- The Federal Highway Administration has established noise standards for the design and citing of all new interstate highways and for the design and approval of projects to reduce the noise from existing highways.

- The Department of Transportation is directing research and development activities to demonstrate quiet trucks and quiet tires for all vehicles on the highways in order to reduce transportation noises.

3. Finally, discuss with students the following three issues:

Does it seem that the Federal government's actions are effective? How can you tell?

Are there other actions the Federal government should be taking but isn't? If so, what are these actions? Why might the government not take these actions? What constraints may make it difficult for the government to take further action or to enforce the legislation it has enacted?

How can citizens help the Federal government to take effective actions to reduce transportation's harmful effects on the environment--for example, by attending hearings, by sending their opinions to government agencies, and by getting involved in regional transportation planning efforts?

Evaluation Method:

Students describe the actions the government is taking to resolve conflicts between transportation and the environment by role playing dialogues between "newspaper reporters" and "government public information officers" (government officials responsible for communicating government policies to the press and the public).

ACTIVITY #6*

Mini-unit Topic: Surveying the Field

Approximate Class Time: 1 period

Capsule Activity Description: Students discuss kinds of citizen participation the public can engage in to balance the needs of transportation and the environment.*

Goal:

To know what types of citizen participation the public can engage in to promote harmony between transportation and the environment.

Concepts Treated:

- Promoting harmony between transportation and the environment is often difficult.
- The public can engage in citizen participation which will effectively help balance transportation and the environment.
- Citizens need to decide for themselves when it is appropriate to engage in citizen participation to promote harmony between transportation and the environment.

ACTIVITY

Have students write what they would do to prevent the environmental problems described in one or more of the scenarios provided on Spirit Master #3.** Tell them for the time being not to consider whether they would or should take action, but to focus exclusively on what actions they *could* take which would be effective in solving the problems presented.

Read aloud several of the students' responses and record on the blackboard in outline form the major actions the students indicated they could take. Next, discuss for one or more of the proposed types of citizen participation

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*This activity also appears in Mini-unit 6.

**Since these scenarios are also applicable to Activity #26, you may want to save at least one scenario for use later with that activity.

- *Why* they would be effective
- Whether they would be *appropriate and justifiable* actions to take
- Whether most or any people when confronted with these scenarios in real life *would actually undertake* these actions and why

Conclude the activity by asking the class to consider the merits and disadvantages of the following potential types of citizen involvement. Also ask your students which, if any, of these methods of citizen participation young teenagers or adolescents their own age can engage in.

Writing letters or engaging in petition campaigns directed at (1) such regulatory agencies (Federal, state, local) as the Environmental Protection Agency (EPA), Federal Aviation Administration (FAA), and Civil Aeronautics Board (CAB); (2) politicians, such as Congressmen, Senators, executives (e.g., President, mayor, governor, town manager); (3) local transportation agencies, such as mass transit authorities, port authorities, department of public works, department of highways; (4) state departments of transportation; (5) local consumer protection agencies; (6) media (TV, radio, newspaper) "Action Lines"; and (7) letters to the editors of local newspapers. Such campaigns might be designed to achieve strong or stronger legislation on such issues as pollution controls for auto exhausts, strip mining, off-shore oil drilling, speed limits for cars, snowmobile use, auto traffic in the inner city, incentives for use of carpools, use of Highway Trust Fund and other sources for financing mass transit, high taxation or rationing of gasoline, closing airports after a certain hour in the evening, airport expansion, new highway construction, billboards, automobile litter, manufacture and purchase of large cars, mpg minimums for autos, free or inexpensive public transportation, and construction of subways. Alternatively, such campaigns might be aimed at strict enforcement of existing pollution laws through fines, imprisonment, and legislation.

Engaging in volunteer work with national or local environmental organizations.

Creating publicity to educate the public on issues suggested above, by means of advertisements, editorials, and feature articles in local newspapers, monthly city magazines, newsletters of community groups and unions, etc.; lectures; fact sheets, leaflets, etc.; demonstration projects; and radio and television public service announcements.

Giving talks to clubs and organizations--fraternal societies (Elks, Masons, etc.), youth groups (Boy Scouts, Girl Scouts, etc.), and civic groups (Kiwanis, Rotary, etc.).

Organizing meetings with public and private officials and with government agencies and private companies to encourage them to adopt specific actions or discontinue current practices in order to reduce transportation's harmful effects on the environment.

Publicizing and organizing actions at one's place of employment, e.g., formation of carpools as company policy with an incentive system; provision of company shuttle bus to and from nearest public transportation facility during rush hour; subsidization of employees' transit fares and a fee for use of company parking facilities; and provision of free parking to carpool drivers only.

Participating in transportation planning through such actions as becoming involved in the planning of Federal-aid highway projects or in the formulation of environmental impact statements. The Federal Highway Administration (FHWA) works with state highway agencies to ensure that community organizations and individual citizens are actively encouraged to participate in the planning and design of Federal-aid highway projects. Under the Federal aid program, state highway agencies initiate, plan, design, build, and operate highway projects. (The FHWA provides financial assistance and guidance and is responsible for certain key approvals.) Each state highway agency has formulated a community involvement program--part of the state's action plan--which explains the procedures that are followed.*

In addition to community involvement programs, each action plan explains how social, economic, and environmental factors are identified and studied, how the assistance of a wide range of professional skills is obtained and utilized, and how consideration of all feasible alternatives is assured in the highway planning process. Copies of action plans are available from state highway agencies or can be examined in their offices.

Action plan programs for community involvement include opportunities for interested citizens to participate in the planning and design process. In addition to public hearings, most states place emphasis on public meetings. Frequently such meetings are conducted as workshops run with the assistance of local officials and agencies. In many instances coordination meetings are held with local officials prior to the public meetings. Under state action plans, mailing lists are maintained to provide early notification and continued information to known interest groups and individuals. Concerned citizens may contact their state highway agencies and ask to have their names placed on these mailing lists.

To ensure that environmental concerns and values are given systematic consideration equal to economic and technical considerations in the Federal decision-making process, the National Environmental Policy Act of 1969 (NEPA) requires each Federal agency to prepare a statement of environmental impact in advance of each major action, recommendation, or report on legislation that may significantly affect the quality of the human environment. Such actions may include new highway construction,

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*For further information see readings in Chapter III of this Manual and write for copies of *Getting Involved in Transportation* (U.S. Department of Transportation, Office of Consumer Affairs, 400 7th and D Streets, S.W., Washington, D.C. 20590) and *In Productive Harmony: Environmental Impact Statements Broaden the Nation's Perspectives* (U.S. Environmental Protection Agency, Washington, D.C. 20460).

harbor dredging or filling, nuclear power plant construction, large-scale aerial pesticide spraying, river channeling, new jet runways, munitions disposal, and bridge construction.

Each environmental impact statement must assess in detail the potential environmental impact of a proposed action, and all Federal agencies are required to prepare statements for matters under their jurisdiction.

The statement's primary purpose is to disclose the environmental consequences of a proposed action, thus alerting the agency decision maker and the public to the environmental risks involved.

As early in the decision-making process as possible, and in all cases prior to agency decision, an agency prepares a draft statement for review by appropriate Federal, state, and local environmental agencies as well as by the public.

The impact statement procedure affords the public an opportunity to participate in Federal decisions that may affect the human environment. Each draft statement must be made public by the responsible agency at the time it is circulated for comment, a date not less than 90 days before the proposed action. Draft statements are announced in the *Federal Register* (published daily by the U.S. government and subscribed to by some local public library systems, many university libraries, and most law libraries).

After comment from the agencies and interested parties the statement is prepared in final form, incorporating all comments and objections received on the draft and indicating how significant issues raised during the commenting process have been resolved. Both draft and final statement are made available to the public.

Interested citizens may submit comments to agencies on any impact statement issued by them. If an individual believes a draft statement to be inadequate, he may offer written comments on the draft. If he believes the disposition of his comments in the final statement to be inadequate, he may so notify the agency involved.

In addition to these mechanisms for public participation, many agencies provide for public hearings not only at various stages during the performance of their statutory missions but during the impact statement process itself.

The importance of the role citizens play in the impact statement process has been recognized by the courts. In many cases, the courts have upheld the right, or standing, of citizens to sue on environmental grounds.

Participating in demonstrations, such as picketing, rallies, sit-ins, and boycotts.

Initiating court action, such as civil action against any citizen, government agency, or government for violation or failure to enforce existing legislation--e.g., the Noise Control Act of 1972 or the Clean Air Act of 1970; and injunctions, through class action or personal suits,

against industries and government agencies who pollute or plan to build or operate facilities that will have adverse effects on the environment.

Also discuss what constraints citizens must expect to cope with in attempting to take action, such as the positive effects of transportation on the environment, the social and personal needs transportation meets, and the human and economic costs involved in reducing or eliminating transportation's harmful effects on the environment. The goal of citizen participation is to resolve conflicts and create harmony among the conflicting priorities of society, transportation, and the environment.

Evaluation Method:

Students describe the types of citizen action the public can engage in which will effectively solve the conflicts presented in one of the scenarios on Spirit Master #3 which they did not use during the activity.

MINI-UNIT 2

LEARNING ABOUT THE INTERRELATIONSHIPS BETWEEN TRANSPORTATION AND THE ENVIRONMENT

Many transportation vehicles damage the environment, from automobiles to airplanes to snowmobiles. In addition, the environment can be affected by the by-products of transportation *facilities*, from highway construction noises to gas station odors. This unit treats the general effects these transportation vehicles and facilities have on the environment. This unit also involves students in examining the *beneficial* effects transportation has on the environment, often a neglected aspect of the field. The unit seeks to impress upon students that decisions about transportation and the environment must be made in the light of transportation's benefits to society and to the environment as well as in response to its damage to the environment.

Various features of the environment may also affect travel safety, convenience, expense, and enjoyment. This unit is designed to help students explore the relationship between transportation and the environment from this perspective, too.

In short, this unit promotes the major concept that there are many *interrelationships* between transportation and the environment and that the interaction between the two must be kept in mind in any attempt to balance the often conflicting needs of both. The unit also seeks to encourage adolescents and young teenagers to think about what types of action and citizen involvement they can engage in which will help promote harmony between transportation and the environment.

Other important concepts treated in this unit include

- Understanding the effects of transportation on the environment is promoted by putting oneself in the position of people who are directly affected by transportation vehicles and facilities.
- Transportation vehicles and facilities create a variety of noises, many of which have harmful effects.

MINI-UNIT 2 LESSON PLAN

Learning about the interrelationships between transportation and the environment

Activity #	*Activities*	*Class Time*
7[a]	DESCRIPTION: Students identify the major effects transportation has on the environment and ways in which features of the environment sometimes affect travel.[a] GOAL: To know how transportation vehicles and facilities and the environment interact in positive and negative ways.	½-1 period
8	DESCRIPTION: Students take field trips to experience transportation's beneficial and harmful effects. GOAL: To know what effects transportation has on the environment.	1½-2 periods plus out-of-class time
9 Spirit Master #4	DESCRIPTION: Students take field trips to identify and classify pleasant and unpleasant noises associated with transportation vehicles and facilities. GOAL: To know what sounds transportation vehicles and facilities make which are unpleasant and dangerous.	½-1 period, plus out-of-class time
10	DESCRIPTION: Students discuss ways in which features of the environment can create obstacles which interfere with travel safety, convenience, and enjoyment. GOAL: To know how features of the environment can hamper travel safety, convenience, and pleasure.	½-1 period

[a]This activity also appears in Mini-unit 1.

MINI-UNIT LESSON PLAN (CONTD.)

Learning about the interrelationships between transportation and the environment

Activity #	*Activities*	*Class Time*
11[a] Spirit Masters #1a, #1b, #2	DESCRIPTION: Students play a board game that reviews potential beneficial and harmful environmental consequences of different modes of transportation.[a] GOAL: To know some of the beneficial and harmful effects transportation has on the environment.	½-1 period

[a]This activity also appears in Mini-unit 1.

Total Class Time: 3½-6 periods.

ACTIVITY #7*

Mini-unit Topic: Learning about Interrelationships

Approximate Class Time: ½-1 period

Capsule Activity Description: Students identify the major effects transportation has on the environment and ways in which features of the environment sometimes affect travel.*

Goal:

To know how transportation vehicles and facilities and the environment interact in positive and negative ways.

Concepts Treated:

- Transportation has significant effects on the environment.
- Some of transportation's effects on the environment are beneficial while others are harmful.
- The environment can create conditions which facilitate or hamper travel safety, convenience, and enjoyment.

ACTIVITY

Students indicate what they believe the major ways are in which use of transportation vehicles affects the environment both positively and negatively and how features of the environment may affect travel safety, convenience, and enjoyment. List these on the blackboard.

After students have exhausted their ability to identify effects, you can check their efforts against the following:

1. Examples of transportation's harmful effects on the environment: air pollution; noise pollution; visual unsightliness; water pollution; litter; land misuse; energy consumption and depletion; displacement of people and businesses; and the solid waste disposal problems of junk

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*This activity also appears in Mini-unit 1.

2. Examples of how use of transportation can benefit the environment: reducing stop-and-go traffic; providing access to parks, historic sites, natural environment areas, etc.; fighting forest fires; crop spraying; facilities for viewing scenery; collecting garbage; air-lifting food to stranded livestock; forest seeding and fertilizing; weather control; insect control; pollution monitoring; and visual attractiveness

3. Examples of how the environment creates obstacles which interfere with travel safety, enjoyment, or convenience: litter, commercial signs; obstacles to clear vision (trees, curves, etc.); garbage dumps; and automobile junkyards

Conduct a follow-up discussion on *why* students may have failed to mention all these effects. For example:

- As adolescents or young teenagers who do not yet drive, are they unaware of these effects, not having personally experienced them?
- Did they neglect to mention the energy shortage as it relates to transportation because they felt there was nothing they could do about it?
- Did they fail to mention noise pollution from vehicles because they live in a rural area?
- Are they unaware of how significantly noise affects some people?
- Did they fail to mention attractive scenery and natural environment areas made accessible by highways and vehicles because students do not think in terms of transportation's positive effects on the environment?
- Did they fail to note how freeways in cities, to the extent that they draw off traffic from city streets, reduce pollution by limiting stop-and-go traffic because the students have never realized that highways can reduce pollution?
- Did they fail to mention forest seeding and fertilizing from airplanes because they live in urban areas and are unfamiliar with farming and forestry practices?

Evaluation Method:

Students describe the major ways in which transportation vehicles and facilities and the environment interrelate for good and ill.

Variation and Supplementary Activity:

Students can identify and discuss the beneficial ways in which aircraft are used in relation to the environment. One of the sections in Chapter III of this Manual, "Readings on Transportation and the Environment," addresses this issue.

ACTIVITY #8

Mini-unit Topic: Learning about Interrelationships

Approximate Class Time: 1½-2 periods, plus out-of-class time

Capsule Activity Description: Students take field trips to experience transportation's beneficial and harmful effects.

Goal:

To know what effects transportation has on the environment.

Concepts Treated:

- Transportation has impacts on the environment which directly affect people in both positive and negative ways.
- Understanding the effects of transportation on the environment is promoted by putting oneself in the position of people who are directly affected by transportation facilities and vehicles.

ACTIVITY

Small groups of students visit sites where transportation's effects on the environment are visible in order to experience the effects themselves. Groups begin by deciding what sites to visit. Sample sites are described on pages 55 and 56. Groups then determine for each site what observations they plan to make at the site. Sample questions to ask are also provided on the following page. Groups make travel and access arrangements with your assistance, as needed.

After conducting the field trips, groups meet to discuss their experiences and to answer the questions they posed at each field site visit. Part of the discussion should focus on the extent to which residents have a legitimate grievance if they became residents *after* the problem existed or have taken *no preventive measures* of their own. Groups prepare and present reports to the class describing their experiences. Groups respond to questions and comments from you and the other groups. For example, you might ask them whether *they* currently experience any unique effects of transportation on the environment because of their young age and whether they can expect to experience different effects or more or fewer effects when they are older.

Evaluation Method:

Students write biographical sketches describing a day in the life of a typical resident or worker at one of the sites they visited.

SAMPLE FIELD VISIT SITES AND QUESTIONS

In a *residential area near an airport and over which planes take off and land,* students can listen to noise, attempt conversation during it, attempt to listen to a portable radio during it and question passers-by about their reactions to the noise, including teachers and students at any nearby schools. Students can seek answers to such questions as

1. Does the noise hamper communication? To what extent?
2. Does the noise cause discomfort? How much?
3. Does the noise make it hard to concentrate? To think?
4. How often does the noise occur?
5. Do residents seem (or say they are) bothered by it?
6. Did residents move into the area before or after the airport was built or expanded?
7. Have or could residents take any steps to try to reduce the noise--for example, plant trees or build walls?
8. Who benefits from the airport and how are they benefited? Do the benefits outweigh the adverse effects? Why?

In a *residential area where there are major, limited-access highways or busy roads traveled by cars and trucks at high speed,* students can listen to the noise, attempt conversation or listen to a radio during it, and question people who live in abutting houses about their reactions to whatever noise and exhaust fumes may be evident. Standing in one place, students can seek to determine if the ground shakes as vehicles pass. Students can seek answers to specific questions such as the eight listed above and to the following:

9. Does the automobile exhaust make breathing unpleasant?
10. Do the vehicles shake the ground and the abutting homes?

On the shore of a *lake frequented by motorboats,* students can listen to the sounds of the motors and examine the water for oil and gasoline film. Students can seek answers to such questions as one through eight above. Residents living on the shore can be interviewed, as can bathers and boaters.

In a *historic site, park, or other natural environment areas which require some form of transportation for access,* students can seek answers to such questions as

11. Could the public enjoy this area without the availability of convenient, safe, and inexpensive transportation facilities?

12. What are the estimated costs of the facilities and modes of travel necessary to reach the area?

13. Who takes advantage of the facilities to visit the areas? Do all citizens participate equally?

In a *section of town which has been relieved of traffic by the construction of a major highway,* students can seek answers to such questions as

14. What were conditions like before the highway was built?

15. What specific benefits has the highway provided the neighborhood--for example, fewer cars? More safety? Less pollution? Greater privacy?

16. Did the highway encroach on parkland? Did it displace residences?

In a *facility responsible for fire fighting, crop spraying, forest seeding, insect control, weather control, or garbage collection,* students can learn the ways in which the vehicles or facilities benefit the environment by going along to observe when fire fighting, garbage collection, etc. take place.

Near a *rural highway,* students can ask rural dwellers

17. Did the highway cut off farmlands?

18. Did it allow greater speed in delivery of crops and supplies to farmers?

ACTIVITY #9

Mini-unit Topic: Learning about Interrelationships

Approximate Class Time: ½-1 period, plus out-of-class time

Capsule Activity Description: Students take field trips to identify and classify pleasant and unpleasant noises associated with transportation vehicles and facilities.

Goal:

To know what sounds transportation vehicles and facilities make which are unpleasant and dangerous.

Concepts Treated:

- Transportation vehicles and facilities create a variety of noises, many of which have harmful effects.
- Citizens need to be aware of which sounds emanating from transportation vehicles and facilities may cause hearing impairment over an extended period of time.

ACTIVITY

Two or three days before the activity, instruct students to keep a log of all pleasant and unpleasant noises they hear from anything related to transportation, such as sirens, horns, engines, car tires squealing, farm equipment, and accident noises. Before keeping the log, the class briefly identifies some of the possible sources of such noises, including cars, airplanes, boats, trains, trucks, buses, recreational vehicles, automobile factories, highway construction, and police whistles directing traffic. Students should also be made aware of the following considerations:

- They should be attuned to sounds not just from obvious vehicles like cars and airplanes, but also from less obvious transportation-related sources like highway construction crews.
- They should try to notice if there are sounds they do not hear, like the humming of lights in a library or background music in a store, that nevertheless may have an effect on people.
- They should keep an eye out for modified or souped-up vehicles that create noises which the original vehicle did not make.

Also instruct students not to record repeated noises *every* time they occur, such as every airplane landing or every horn that is honked. Finally, tell students to make their notes specific--not to record, for example, that "cars made noise" but that the *muffler* make the noise or the *tires* squealed.

After two or three days of note-taking, divide the students into small groups and give them written instructions to read each other's logs:

1. Make a list of all the pleasant and unpleasant sounds you heard.

2. Note which sounds more than one student heard.

3. Note which sounds were heard often--several times or more.

4. Put the sounds into five lists: unbearable, unpleasant, neutral, pleasant, very pleasant.

The groups report their conclusions to the class and respond to comments and questions from you and each other. Discussion follows the questions asked below.

1. Which transportation sounds are pleasant, which are unpleasant, and how people distinguish them

2. Whether sounds that are unpleasant may also seem dangerous to the students

3. Whether the students' personal reactions to the estimation of the dangers of the sounds they heard compare with the information provided on the sound decibel chart on Spirit Master #4

4. Whether or not the class as a whole or selected individuals can agree on identifying unpleasant or dangerous transportation sounds that they feel justified in taking action to reduce or eliminate

5. How citizens can avoid unpleasant sounds associated with transportation and whether some sounds cannot be avoided

6. What actions the government has taken and should take to reduce noise pollution

7. When citizens are entitled to take action to prevent or alter unpleasant or dangerous sounds associated with transportation

8. What constraints may make it difficult or expensive to eliminate such unpleasant or dangerous sounds

9. Whether most or all people can agree on what constitutes an unpleasant or dangerous transportation sound

Evaluation Method:

The students write a brief flyer for persons with sensitive hearing, indicating sounds they should avoid (including those emanating from transportation sources).

Variations and Supplementary Activities:

Students can discuss whether rural (or urban or suburban) dwellers would hear different transportation noises and why.

Instead of keeping a log, students can report to the class verbally.

You can lecture on the effects of noises on hearing, sleep, concentration, and so forth by reading the section in Chapter III of this Manual on noise and its effects.

ACTIVITY #10

Mini-unit Topic: Learning about Interrelationships

Approximate Class Time: ½-1 period

Capsule Activity Description: Students discuss ways in which features of the environment can create obstacles that interfere with travel safety, convenience, and enjoyment.

Goal

To know how features of the environment can hamper travel safety, convenience, and pleasure.

Concepts Treated:

- The environment can create conditions which facilitate or hamper travel safety, convenience, and enjoyment.
- Students need to identify types of citizen participation the public can engage in which will help balance the needs of transportation and the environment when the two conflict.
- There are types of citizen involvement and actions which young teenagers can engage in which can help promote harmony between transportation and the environment.

ACTIVITY

Conduct a class discussion on how features of the environment can interfere with travel safety, comfort, and pleasure. Focus on four areas of concern:

1. The concept of creating harmony between transportation and the environment
2. Ways in which features of the environment can affect travel safety, convenience, or enjoyment
3. Law relating to features of the environment which affect travel
4. Methods by which citizens can reduce the impact of features of the environment which interfere with travel safety, convenience, or pleasure

Begin the discussion by pointing out that although we commonly think of transportation and the environment only in terms of how transportation harms the environment, there are significant ways in which features of the environment can create obstacles to safe, pleasant, and comfortable travel. The goals of the citizen and of the government should be to identify the ways in which transportation and the environment affect *each other* and identify and support methods by which they can "live together" in harmony. This means that there will be times when transportation must be controlled or reduced to avoid or minimize some of its harmful effects on the environment, but also times when features of the environment must be altered so they do not hinder travel safety, convenience, and enjoyment. Conclude this introduction to the activity by reminding students that the concepts of "transportation" and "environment" must be interpreted broadly if harmony is to be promoted to the fullest extent possible.

> Transportation refers to the use and purchase of transportation goods and services, while environment includes all man-made artifacts as well as the natural surroundings.

Ask the class for examples of how features of the environment might hinder travel safety, convenience, and enjoyment. As your students have not yet driven a car, ask them to think of complaints their parents or older siblings may have made about how features of the environment interfere with their driving. Examples you can use to supplement the students' suggestions follow:

- *Commercial signs and billboards* can spoil scenery, reduce travel pleasure, and create distractions for drivers.
- *Automobile "graveyards"* can have the same effects.
- *Litter* can have similar effects and, in addition, create safety hazards for drivers and passengers in vehicles which skid on litter or swerve to avoid it.
- *Distractions* along roads and highways, such as sunbathing areas, drive-in movie theatres with screens facing the highway, and athletic fields, can cause accidents.
- *Interferences with visibility* such as trees, tree limbs, buses, and hills can cause accidents.

Next, ask the class to indicate what laws, if any, should be passed to prevent these features of the environment from interfering with travel and present some of the legislation which now exists in this area, such as the Highway Beautification Act which regulates junkyard locations. (See Chapter III of this Manual, "Readings on Transportation and the Environment.") In addition, other provisions of the act prohibit billboards within 660 feet of the right-of-way of Federal-aid interstate and primary highways outside commercial and industrial areas. The Federal-aid Highway Amendments of 1974 extend Federal control over outdoor advertising by prohibiting those signs, displays, and devices "erected beyond 660 feet from the right-of-way, located outside of urban areas, of such size as to be visible" and "erected with the purpose of their message being read from

such main traveled way." The Act provides for just compensation for the removal of the advertising lawfully erected under state law. Using 100 million dollars in funds from the Federal Highway Administration, the states removed 321,000 billboards from the nation's highways between 1971 and 1974.

Conclude the discussion by asking students to suggest ways in which citizens could become involved in reducing the environment's effects on transportation so that transportation and the environment can coexist. It will be useful at this stage to point out that all citizens can accept personal responsibility for their own *individual* actions--and that some citizens will want to go further and involve themselves in participatory actions on a community level. Examples of personal and participatory citizen actions are provided in the activities in Mini-units 5 and 6. Specific types of citizen participation you can present include keeping lakes and rivers free from pollution to ensure that recreational boaters are not disturbed by unsafe objects in the water and by visual unsightliness; not littering highways and waterways and encouraging others not to; discussing with neighbors ways in which their trees, bushes, etc. can be pruned or replanted if they present visual obstructions to automobile travelers, bicyclists or pedestrians; pointing out to the proper authorities any violations of Federal or local laws regarding the environment; and participating in highway planning so that roads are built in ways that promote travel safety, convenience, and enjoyment.

You may discuss with the class which, if any, of these actions young teenagers can appropriately engage in and how they may do so.

Evaluation Method:

Students select an appropriate feature of the environment in their community and describe how it hinders travel safety, convenience, or enjoyment.

Variations and Supplementary Activities:

Students can engage in one or more of the suggested citizen activities to eliminate a feature of the environment which hampers travel safety, comfort or convenience.

Students can interview highway officials and department of transportation officials on ways in which features of the environment hamper travel and on what citizens can do to maintain harmony between transportation and the environment.

Students can research and discuss how effective the provisions of the Highway Beautification Act have been in removing billboards from highways and what obstacles delay its full implementation, such as foot-dragging by states, opposition by the tourist industry, reluctance of the sign-producing industry to cooperate in establishing a quick cost assessment system, and lack of concern on the part of the public and environmental groups.

ACTIVITY #11*

Mini-unit Topic: Learning about Interrelationships

Approximate Class Time: ½-1 period

Capsule Activity Description: Students play a board game that reviews potential beneficial and harmful environmental consequences of different modes of transportation.*

Goal:

To know some of the beneficial and harmful effects transportation has on the environment.

Concept Treated:

- Transportation vehicles have both beneficial and harmful effects on the environment.

ACTIVITY

Students exercise their knowledge of transportation's effects on the environment by playing a simple board game. Materials required include a small game board (provided in Spirit Masters #1a and #1b), a set of cards for each player (provided on Spirit Master #2), and a die for each group of players.

Divide the class into small groups of three or four students. Each group is given a set of game materials. The first time the game is played, students cut out their own transportation effects cards and paste the "game board" onto cardboard for durability. Each group will need a die to determine the number of boxes to move on the board. Instructions for playing the game appear on the game board.

Evaluation Method:

The game is self-evaluating.

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*This activity also appears in Mini-unit 1.

MINI-UNIT 3

LEARNING ABOUT THE AUTOMOBILE'S EFFECTS ON THE ENVIRONMENT

This mini-unit treats the most important single cause of environmental pollution--the automobile. Paradoxically, the automobile enhances our ability to enjoy the very features of the environment it so profoundly damages. Given this striking interaction between the automobile and environment, it seems appropriate to provide a separate mini-unit which focuses exclusively on this relationship.

This unit also closely examines the indirect effects automobiles have on the environment, including the use of considerable land for highways and roads and the visual effects of highways, billboards, and litter.

Finally, the unit promotes the development of decision-making skills among students in terms of balancing the conflicting demands of the automobile and the environment. Specifically, the unit helps students to assess

- The relative positive and negative impacts on the environment that are created by highways and roads
- How people who do not drive, like young teenagers, nonetheless benefit from and are harmed by automobile travel

MINI-UNIT 3 LESSON PLAN

Learning about the automobile's effects on the environment

Activity #	*Activities*	*Class Time*
12	DESCRIPTION: Students discuss the automobile's beneficial and harmful effects on the environment. GOAL: To know the automobile's beneficial and harmful effects on the environment.	½-1 period
13	DESCRIPTION: Students engage in one or more scientific experiments that illustrate the harmful effects of automobiles on the environment. GOAL: To know some of the harmful effects automobiles can have on the environment.	½-2 periods
14 Spirit Master #5	DESCRIPTION: Students discuss the automobile's indirect effects on the environment. GOAL: To know what indirect effects automobiles have on the environment.	½-1 period
15	DESCRIPTION: Students identify the beneficial effects highways and roads can have on the environment by evaluating a local highway or road in these terms. GOAL: To be able to evaluate the relative beneficial and harmful effects highways and roads have on the environment.	½-1 period

Total Class Time:
2-5 periods.

ACTIVITY #12

Mini-unit Topic: Learning the Automobile's Effects

Approximate Class Time: ½-1 period

Capsule Activity Description: Students discuss the automobile's beneficial and harmful effects on the environment.

Goal:

To know the automobile's beneficial and harmful effects on the environment.

Concepts Treated:

- The automobile has provided extensive services and will continue to do so.
- The automobile has positive effects on the environment.
- The automobile has several negative effects on the environment.
- People who do not drive nonetheless benefit substantially from and are harmed by automobile travel.

ACTIVITY

Begin the activity by asking students to identify some of the major ways in which the automobile provides important and even indispensible services to people, including

- Opportunities to visit people who live some distance away
- Quick transportation in an emergency
- Access to jobs and entertainment
- Opportunities to shop where prices may be cheaper or the quality of goods may be higher

Then focus on some of the positive effects cars have on the environment, including:

- Enabling the public to view scenery

- Enabling people to visit parks, historic sites, and natural environment areas (which otherwise might be inaccessible to most people)

Since your students do not yet have drivers' licenses, you might ask them to discuss the benefits automobiles provide to people like themselves who do not drive.

Finally, have students discuss the harmful effects automobiles have on the environment, supplementing their ideas with the following, as needed:

1. Air pollution, affecting health, foliage, animals, weather, and clothing

2. Noise pollution, affecting health, communication, concentration, and sleep

3. Visual pollution, such as billboards, signs, gas stations, automobile junkyards, and litter

4. Energy depletion

Ask your students whether they feel they are harmed by any of these effects even though they do not drive.

For supplemental information about these effects, you can read or reread the appropriate sections in Chapter III in this Manual, "Readings on Transportation and the Environment."

Conclude the activity by noting that facilities which are built to make automobile travel possible--notably, highways and roads--have major positive and negative impacts on the environment and that these aspects of the problem are discussed in Activity 13.

Evaluation Method:

Students describe the beneficial and harmful effects automobiles have on the highway and justify their evaluations.

ACTIVITY #13

Mini-unit Topic: Learning the Automobile's Effects

Approximate Class Time: ½-2 periods

Capsule Activity Description: Students engage in one or more scientific experiments that illustrate the harmful effects of automobiles on the environment.*

Goal:

To know some of the harmful effects automobiles can have on the environment.

Concept Treated:

- The harmful effects of transportation vehicles on the environment are easily demonstrated.

ACTIVITY

The effects of car exhaust pollution on clothing

Materials needed:

Iron

Ironing board

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*These science experiments were developed for this activity by Donald Bockler, Belmont, Massachusetts, a secondary school science teacher.

Note: This activity includes some experiments which may involve killing or injuring plants or animals. You or your students may feel that it is wrong for ethical or educational reasons to kill living things in a course designed to motivate students to protect the environment--or at any time. If you or your students feel this way, you may want to simply describe what the results of the experiment would be if you performed it and then discuss with your students when and if such experiments are appropriate.

Nylon stockings

35-mm photoslide holder

Slide projector

Students iron 1½-inch squares of single mesh nylon (from old nylon stockings, not from stretch pantyhose type) in the middle of a "Ready-mount" 35-mm photoslide holder. Different slides of the same type should be placed in various locations where traffic is heavy, such as gasoline station garages, busy intersections, residential street corners, bus stations, airports, and train depots, and in the rural countryside. The slides should be labelled with the name of the school, student, location and date.

After 10 days of contamination, the slides are brought back into the classroom and projected onto a screen. "Breaks" in the nylon can be counted and compared with an initial count. The slides can be taken back to their pollution sites and allowed to sit for another ten days, if time allows. Results may be presented in a table or graph.

Students then discuss the relative deterioration of nylon in the different areas and the role of transportation in creating air pollution.

Variations

- Slides may be placed directly underneath different cars and buses, for a more specific study of the different modes of transportation.
- Different thin, net materials may be tested.

Particulate pollution from vehicles

Materials needed:

Petroleum jelly

Microscope slide

Transparent metric ruler

Students coat one side of a microscope slide with a thin layer of petroleum jelly and hang or place the slide in various locations where traffic is heavy, such as gasoline stations, bus and subway stations, train depots, busy intersections, residential street corners, and airports; in the rural countryside; or simply outside the classroom window or on the roof.

After 10 days, the slides are examined under a microscope and the relative numbers of particles per square millimeter or per microscope field are counted and recorded. The number of square millimeters of a microscope

field may be measured by placing a transparent metric ruler under a microscope to measure the diameter of the field. The area of the field may then be computed using the formula

$$\text{Area} = \pi(\text{Radius})^2$$

Students discuss the roles of automobiles, buses, etc., in releasing particulate matter into the air and possible health consequences and cleaning bills.

Effects of sunlight on gasoline

Materials needed:

Ozone/ultraviolet lamp

Small clear box or cutaway shoe box and cellophane

Saucer

Tablespoon

Gasoline

Place an ozone/ultraviolet lamp inside a small clear box or a cutaway shoe box with a cellophane or plastic top along with a saucer containing one tablespoon of gasoline. Turn on the ozone lamp and observe the following petrochemical reaction:

$$O_2 \xrightarrow{\text{Ozone lamp}} O_3 \text{ (Ozone)}$$

$$O_3 + \text{Gasoline} \longrightarrow \text{Aerosol smog}$$

Students relate this reaction to the effect of the sun's ultraviolet rays on gasoline from motor vehicles.

Variations

- The ozone lamp may be used to test the effects of ozone on rubber, such as pieces of automobile tire, over time.
- An induction coil producing a continuous spark may be used in place of the ozone lamp in experiments *NOT* involving flammable gasoline.

Effects of sulfur dioxide emitted by car exhausts on plant life

Materials needed:

Two identical plants

Two large, wide-mouth jars

2 ml of 5 percent sulfuric acid

2 gm sodium sulfite

Students put two identical plants, such as geraniums, inside two large (at least one gallon), wide-mouth jars which can be sealed airtight. Insert a small container with 2 ml of 5 percent sulfuric acid (H_2SO_4) next to one of the plants in one of the jars. Carefully add 2 grams of sodium sulfite (Na_2SO_3) to the sulfuric acid and seal the top of the jar. Seal the second jar without adding any extra chemicals to the plant or jar. This will serve as a control. Observe and record the appearance of the plants before the experiment and each day for the next few days.

Students then discuss the causes and effects of sulfur dioxide pollution--in particular, the effect of automobile exhaust on plant life. Class discusses how things that affect plants might also affect animals and human beings.

Variations

- A large plastic bag may be used in place of the jar if all holes are sealed with tape and the opening of the bag is taped shut.
- Small animals could be tested instead of plants. Animals such as sowbugs, grasshoppers, earthworms, snails, frogs, and mice make good subjects.

Effects of gases commonly found in emissions from transportation vehicles on living and nonliving materials

Materials needed:

Wide-mouth jars

Gases--sulfur dioxide, ozone, hydrocarbons, nitrogen dioxide

(See materials to be tested at end of experiment.)

Students suspend or place objects inside an air-tight test chamber containing gases such as sulfur dioxide (SO_2), ozone (O_3), hydrocarbons, nitrogen dioxide (NO_2), and carbon monoxide (CO). The gases should *always* be introduced under a fume hood to prevent harm to

the students. These gases are available in cylinders from many chemical supply houses. The air-tight test chambers can be wide-mouth jars with good, reliable tops; glass aquaria; or bell jars. Gas concentrations may be controlled by using gas sampling detector tubes, such as Eduquip Gas Sampling Kit, available from various supply houses. Gas concentrations best tested in this study would be as follows:

SO_2 = 1 ppm (part per million) for 1 hour

O_3 = 0.25 ppm for 30 minutes

NO_2 = 0.25 ppm for 1 hour

CO = 120 ppm for 1 hour

Hydrocarbon = 900 ppm for 1 hour

Materials to be tested in these test chambers

1. Metal alloys - aluminum, copper, brass, silver, steel, zinc
2. Rubber - tires, rubber bands
3. Fabrics - cotton, wool, nylon, silk (dyed or undyed)
4. Paints, stains, varnishes
5. Plants - onion, rose, lettuce, bean, clover, tomato
6. Fungi - mushrooms, mold, yeast
7. Animals - fruit flies, sowbugs, earthworms, ants

Variations

- Time and concentration of gases may be varied.
- Combinations of different gases may be tested.

Concentration of carbon monoxide in an area of high transportation vehicle density

Materials needed:

Detector tubes

Students sample and determine the concentration of carbon monoxide emissions in such areas as bus and subway stations, train depots, gasoline stations, busy street corners, quiet residential areas, rural countryside, and airports. Carbon monoxide detector tubes (e.g., Eduquip Gas Sampling Kit) are available from chemical supply houses. Samples of air are taken into the gas detector tubes and the specific concentration of gas is identified by a color change in the tube.

Students discuss and account for the variations observed in the different locations.

Variations

- Sample emissions from automobiles with air pollution controls can be compared to those taken from cars without air pollution controls.
- Students can alter the idle speed of an automobile and test exhaust for carbon monoxide changes.

Effects of gasoline or oil spills on fresh-water plants and animals

Materials needed:

10-gallon or larger aquarium

Fresh-water fish

Plants

Gasoline

Motor oil

Students set up a 10-gallon (or larger) aquarium with various common fresh-water fish (guppies, goldfish) and plants (Elodea, sea grass, algae). Then a few drops of gasoline are placed on the water, representing a spill from a power boat. Observations are made of any changes in normal growth and behavior patterns.

In another aquarium, or the same one at a later date, a few drops of motor oil are placed on the water. Observations and comparisons are made between various spills and their effects.

Variations

- The "oil spill" could be made on a small lagoon in a lake and changes in plant and animal life could be noted by sampling at various intervals.
- Samples of plant and animal life could be taken from an area near a busy dock and compared with samples taken from a similar area where light boat traffic occurs.

Oil absorption abilities of various materials

Materials needed:

Oil

Water

One-square-foot trays

Hay

Cloth

Newspaper

Paper towels

Sponge

Weighing scales

Students pour oil on top of water in trays of at least one square foot surface area until the surface is just covered. Equal amounts of oil should be poured into equal size trays of water for each material to be tested. Students then try to absorb all of the oil using such materials as hay, pieces of cloth sheets, newspaper, paper towels, sponge, and whatever other materials they can think of. As much material should be added to the tray as is needed to absorb all of the oil. The material is then set aside and weighed to find out how much material was needed to absorb the oil. The weights and relative absorption abilities can then be compared. Results can be discussed in terms of difficulty in removing oil slicks from beaches and shore lines.

Sound deadening characteristics of an automobile muffler

Materials needed:

New automobile muffler

Old automobile muffler

Microphone (optional)

Oscilloscope (optional)

Students produce a loud sound of a known and repeatable quality and pass this sound through a new muffler and an old, discarded muffler. The muffled sound is then compared with the original sound in both cases. A microphone connected to an oscilloscope can be used to compare the initial and final sounds quantitatively.

Variations

- The needle for volume on a good hi-fi amplifier or tape recorder can be used to compare relative sounds.
- A decibel meter can be used to find out the exact intensities of the sounds.
- New and worn-out mufflers can be opened up to investigate muffler sound baffles.

Noises produced by automobiles, buses, subways and other transportation vehicles

Material needed:

Decibel meter

Students measure the noise produced by an automobile pulling away from a curb and compare this noise to a bus pulling away from a curb, and a subway pulling away from its stop. (The noise can be measured using a decibel meter.)

Students should discuss the relative amounts of noise produced by each mode of transportation and determine the amount of noise produced per person being transported. For example, if a bus can carry the same number of people as 30 automobiles, cars create the most noise pollution per passenger transported.

Variation

- Students may record the sounds on tape and analyze them later on such school equipment as an oscilloscope.

You can conclude the activity by pointing out that there is some disagreement among the experts over how much or how serious the damage is which transportation vehicles cause to the environment. Ask your students

to discuss how serious they think these effects are, based on the results of their experiments. Ask them to decide whether their experiments have provided them with enough information to assess the extent and seriousness of transpertation's harmful effects on the environment.

Evaluation Method:

Students describe how their experiments illustrate the harmful effects automobiles can have on the environment.

ACTIVITY #14

Mini-unit Topic: Learning the Automobile's Effects

Approximate Class Time: ½-1 period

Capsule Activity Description: Students discuss the automobile's indirect effects on the environment.

Goal:

To know what indirect effects automobiles have on the environment.

Concepts Treated:

- The automobile has many major indirect effects on the environment, some are beneficial and others are harmful.
- The most important indirect effects of automobiles on the environment are caused by highways and roads.

ACTIVITY

Students in small groups identify and evaluate the automobile's indirect effects on the environment. Prior to class, students write their responses to the scenario provided on Spirit Master #5. Divide the students into small groups and give them written instructions to read each other's papers and to

1. List the items you wrote about that exist solely or primarily for the support of the automobile. (Examples include gas stations, home garages, parking lots, signs, streets, and highways.)
2. Think of other kinds of facilities that are needed to service the automobile.
3. Discuss the indirect effects that each facility has had on the environment in your community.
4. Discuss the role each facility plays in servicing automobiles.
5. Discuss how prevalent or widespread each of these facilities is--how many there are in your community.
6. Discuss these facilities in terms of what positive effects, if any, they have on the environment. Are they interesting or attractive to

look at (for example, well-designed bridges, aesthetically built highways, tastefully landscaped roads, architecturally appealing gas stations or subway stations)? Do they contribute to the cleanliness or orderliness of the neighborhood? Do they make possible or facilitate travel to parks, historic sites, or other natural environment areas? Do they remove traffic from the city? Do they involve garbage collection or crop spraying?

Are any of the facilities unpleasant to look at (for example, automobile junkyards, ugly or unclear gas stations, grotesque bridges, monotonous highways)? Do any of the facilities discourage travelers from using less polluting forms of transportation? Do any of these facilities present dangers to the community (for example, injuries to children roaming the streets or junkyards, visibility hazards, distractions to drivers)? Are there other important uses the land occupied by these facilities could be put to in most communities (for example, parks, playgrounds, housing)?

7. Discuss the advantages of these facilities, aside from their necessity or desirability for safe, convenient, and pleasant automobile travel, such as the jobs they provide, their potential stimulus to the national economy, and their role in national defense.

8. Discuss the advantages and disadvantages of these facilities in terms of how they may affect the lives of people, including young teenagers like your students, who do not drive automobiles.

After the groups have completed their discussions, have each group present its conclusions to the class and respond to questions from you and from other groups.

Evaluation Method:

Students describe the indirect effects automobiles can have on the environment, using their own community as an illustration.

Variation and Supplementary Activity:

Students can research the amount of time people spend commuting and what they do while commuting. Students can seek answers to questions such as the following:

- How much time does the average commuter spend in his or her car?
- Do commuters who travel by public transportation spend less time commuting?
- Do commuters on public transportation use the time to relax, read, chat, etc.? Do auto commuters?

- Does it appear that auto commuters could commute to work as conveniently by public transportation as by car?

- Have highways relieved the severity of any rush-hour delays, traffic congestion, and pollution or have they created traffic jams of their own?

- Do automobile commuters have parking problems? If so, how are these handled?

- Have any recent developments in transportation in the local community--highways, vehicles, facilities--facilitated commuting by making it safer, more convenient, or more pleasant?

- Are there ways in which features of the environment affect, hinder or facilitate commuting time, safety and pleasure in terms of hampered visibility due to billboards and trees, or unpleasant vistas due to junkyards and billboards?

ACTIVITY #15

Mini-unit Topic: Learning the Automobile's Effects

Approximate Class Time: ½-1 period

Capsule Activity Description: Students identify the beneficial effects highways and roads can have on the environment by evaluating a local highway or road in these terms.

Goal:

To be able to evaluate the relative beneficial and harmful effects highways and roads have on the environment.

Concepts Treated:

- Highways and roads can have beneficial effects on the environment.
- Citizens need to be able to assess the relative benefits and drawbacks to the environment of highways and roads.
- People who do not drive, like adolescents and young teenagers, nonetheless benefit from and are harmed by highways and roads.

ACTIVITY

Break the class into small groups and assign each group to identify all the beneficial effects that highways and roads can have on the environment. Groups report their conclusions to the class and compile a master list of beneficial effects. Supplement this list by mentioning any of the following effects which the students fail to identify.

1. Highways may remove traffic from residential or business streets.
2. Highways may reduce those types of pollution emitted by stop-and-go traffic by providing means for traffic to move through the area at higher speed.
3. Well-planned highways with express lanes for buses may ease traffic congestion and lessen pollution by encouraging people to use public transportation.

4. Highways may provide space for parks and mini-parks through joint development programs in which municipalities and highway agencies cooperate in creating small parks adjacent to the right-of-way.

5. Highways may provide visibility to businesses, which may develop prestige architecture and landscaping for their headquarters.

6. A highway or road may replace an ill-kept, unattractive, or unpoliced area in the community with an orderly facility.

7. Highways may be considered as gatherers of land parcels that provide open space and breathing room, letting the light into an otherwise densely built urban environment.

8. Highway and street development and the associated landscaping, mini-parks, and historic preservation areas may allow beneficial uses of the urban land.

9. Well designed and maintained highways and roads may be of sufficient sophistication in structural and aesthetic design to be interesting features of the environment.

10. Highways often provide views of cityscapes, harbors, and skylines that are interesting, revealing, and attractive.

11. By providing remote views of prominent national landmarks (for example, mountain peaks), highways may help engender appreciation of the natural areas.

12. Highways can protect natural areas by serving and encouraging the use of other natural or recreational areas of less fragility.

13. Where desired, highways and roads can provide access to natural environment areas, for appreciation and recreation.

14. Rest areas along highways can provide attractive spots for viewing the local countryside.

If it has not already done so in Activity #12, the class then identifies the harmful effects highways can have on the environment.

The small groups reform and each group identifies a different road or highway in the community which has recently been built, is being planned, or is under construction. Each group analyzes the beneficial and harmful effects its highway or road has had or may have on the environment and discusses whether, on balance, its benefits outweigh the costs to the environment. The groups report their conclusions to the class and compare findings.

You may need to point out that in weighing the advantages and disadvantages of highway and road construction, not only must the environmental effects of these facilities be considered; additionally their other social benefits and costs must be considered, such as their contribution to travel safety and convenience, and their effect on employment. You might also ask

your students, since they are too young to drive, how highways and roads affect the lives of non-drivers. Are they harmed or benefited even though they never drive? How strongly should the views of non-drivers be considered in deciding whether to build a highway or road?

Evaluation Method:

Students plan a hypothetical highway for their own community which balances transportation and environmental needs.

Variations and Supplementary Activities:

Students can identify ways in which unavoidable harmful environmental effects of roads and highways can nevertheless be mitigated, as in the following ways:

1. Planners can locate highways and roads far enough from sensitive areas so that noise and air pollution are not problems.

2. Noise barriers can be erected to shield residential or other sensitive areas from vehicle noise on highways and roads.

3. Plantings and attractive land-forming can be included in road and highway construction to beautify the right-of-way.

4. Tunnels, platforms, and depressed sections can hide highways and roads in areas of sensitive use or high visual character.

5. Joint development and the use of air and underground rights in the right-of-way can provide a means of visually and environmentally knitting together a neighborhood that would otherwise be severed by a highway or road.

6. Federal and often state relocation programs can provide a mandated service of assistance and payment for relocating homes, businesses, and public facilities displaced by highway construction.

Students can interview appropriate governmental authorities about the beneficial and harmful effects highways and roads can have on the environment.

MINI-UNIT 4

IDENTIFYING SOLUTIONS TO CONFLICTS BETWEEN TRANSPORTATION AND THE ENVIRONMENT

The nature of problem solving is always a key issue in social dilemmas, and conflicts between transportation and the environment are no exception. The need for more and better travel vehicles and facilities often conflicts with the critical importance of protecting the environment. In turn, desirable features of the environment often hinder travel safety, comfort, and convenience.

This mini-unit helps students to identify typical conflict areas between transportation and the environment, methods for resolving these conflicts, and agencies and groups that can contribute to their resolution. The unit does not attempt to cover every possible conflict--an impossible task; rather, it focuses on a few examples of such conflicts and engages students in the *process* of resolving conflicts so that, armed with this skill, they can later turn their attention to coping with the variety of important problems which will confront them in the area of transportation and the environment.

The unit also encourages youngsters to consider whether it is appropriate for adolescents to become involved in citizen participation to help solve conflicts between transportation and the environment and, if so, how.

This unit also treats the following key concepts:

- Citizens need to be aware of the environmental effects of transportation facilities before new ones are planned or built.
- Many, if not all, of the harmful environmental effects of proposed or expanded transportation facilities can be avoided or minimized with careful planning.
- A major solution to conflicts between transportation and the environment lies in government action.
- There are many times when it is appropriate for citizens to engage in citizen participation to oppose a harmful effect of transportation on the environment or to correct a hindrance to travel which is caused by the environment.
- Citizens need to be able to identify when citizen participation is justified to oppose a transportation vehicle or facility which has or will have harmful effects on the environment.

MINI-UNIT 4 LESSON PLAN

Identifying solutions to conflicts between transportation and the environment

Activity #	*Activities*	*Class Time*
16	DESCRIPTION: Students plan and defend the building of a new commercial airport in their community. GOAL: To know some of the effects transportation facilities can have on the environment.	2-4 periods
17[a]	DESCRIPTION: Students discuss and evaluate actions the government is taking to reduce transportation's harmful effects on the environment.[a] GOAL: To know how the government is attempting to balance the needs of transportation and the environment.	½-1 period
18	DESCRIPTION: Students discuss one or more solutions to conflicts between transportation and the environment. GOAL: To be able to resolve conflicts between transportation and the environment.	½-1 period
19[b]	DESCRIPTION: Students discuss when to engage in citizen participation to oppose a harmful transportation effect on the environment or a feature of the environment which interferes with travel.[b] GOAL: To be able to decide when citizens should engage in citizen participation to oppose a harmful transportation effect on the environment or a feature of the environment which interferes with travel.	1 period

[a]This activity also appears in Mini-unit 1.

[b]This activity also appears in Mini-unit 6.

Total Class Time: 4-7 periods.

ACTIVITY #16

Mini-unit Topic: Solving Conflicts

Approximate Class Time: 2-4 periods

Capsule Activity Description: Students plan and defend the building of a new commercial airport in their community.

Goal:

To know some of the effects transportation facilities can have on the environment.

Concepts Treated:

- Transportation facilities often have major environmental effects on the community.
- Citizens need to be aware of the environmental effects of transportation facilities before new ones are planned or built.
- Many, if not all, of the harmful environmental effects of proposed new or expanded transportation facilities can be avoided or minimized with careful planning.
- Citizens need to develop the ability to resolve conflicts between transportation and the environment.

ACTIVITY

Students in small groups plan the building of a new airport in their community.

The period before they begin to plan, the students write their response to the following scenario:

> You are the State Commissioner for Environmental Protection. You have been asked by the Governor to participate in the planning of a new airport which is needed in your state because the old airport cannot handle all the increased air traffic. Where will you build it? Why there?

Break the students into small groups and provide them with maps of their state or with a hypothetical map. Give each group written instructions to

1. Compare and discuss each group member's response.

2. Concretely plan the construction of a new airport, considering such environmental issues as what citizen groups to involve in the planning stages; where to build it; how to obtain the land on which to build it; automobile traffic problems that may result from its construction and how to avoid or minimize them; providing access by public transportation; noise pollution; what the future land use of the area will be; and other environmental considerations you feel are important.

3. Justify every decision you make--for example, why build the airport in the suburbs, countryside, or city?

The groups prepare and present reports to the class, responding to comments and questions from the class and you. A class discussion is held on how to reconcile different groups' plans. Stress the importance of master planning and the development of new transportation facilities or the expansion or relocation of old ones.

Specifically consider:

- Involving all citizens and citizen groups in the planning effort

- Evaluating all possible effects of the construction, expansion, or relocation on the community in general and on other transportation problems and facilities in particular (for example, the effect of airport construction on car traffic patterns on roads leading to and from the airport)

- Preventing future problems before they occur rather than trying to solve them once they exist

Evaluation Method:

Students identify several effects transportation facilities and vehicles have on the environment--effects which were avoided or included in their own hypothetical airport construction plans.

Variations and Supplementary Activities:

Students can plan the expansion of an existing airport or a different group can plan the construction or expansion of different transportation facilities, such as bus terminals, train stations, highways, parking garages, harbors and docks.

Students can invite airline officials or community residents to class to evaluate their proposed construction.

ACTIVITY #17*

Mini-unit Topic: Solving Conflicts

Approximate Class Time: ½-1 period

Capsule Activity Description: Students discuss and evaluate actions the government is taking to reduce transportation's harmful effects on the environment.*

Goal:

To know how the government is attempting to balance the needs of transportation and the environment.

Concepts Treated:

- A major solution to conflicts between transportation and the environment lies in government action to resolve such problems.
- The government is already attempting to balance the needs of transportation and the environment.
- Citizens need to be aware of the government's attempts to balance the needs of transportation and the environment in order to evaluate such items and encourage the government to alter or expand its efforts in this direction.

ACTIVITY

1. Present examples of actions the Federal government is taking to reduce transportation's harmful effects on the environment, such as encouraging less reliance on automobiles through carpooling, emphasis on mass transit, and emphasis on funding for train travel.

> Federal assistance for mass transportation began in 1961 with an emergency loan program and a small test and demonstration program. In 1964 the Urban Mass Transportation Act established a program of Federal matching grants for preservation, improvement and expansion of public transportation systems. Amendments to this Act have provided broader program goals, higher funding levels, longer periods

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*This activity also appears in Mini-unit 1.

of assured Federal assistance and greater flexibility in meeting local needs. Funding increased from 50.7 million dollars in 1965 to 133 million dollars in 1970 to over 1.4 billion dollars in 1976 for the purchase and construction of mass transportation facilities.

The Federal-aid Highway Act of 1973 granted flexibility in the use of highway funds for public transportation purposes by opening Urban System funds (previously targeted solely for highways) to transit, both rail and bus; and by opening all highway funds to exclusive lanes for buses, traffic control devices, bus shelters, parking facilities, etc. In addition, interstate highway funds were also made available for non-highway public transportation purposes under certain conditions.

Significant steps toward rehabilitating the nation's rail system are now being taken as the result of new legislation providing 6.4 billion dollars in Federal aid to railroads. Key features in the law are the following provisions:

- Seven bankrupt Northeast and Midwest railroads are reorganized into the Consolidated Rail Corporation (ConRail), a freight railroad in which the Federal government is authorized to invest. The law provides 2.1 billion dollars for the start-up of ConRail.

- The Department of Transportation will upgrade rail passenger service in the Northeast Corridor. The five-year program will cost 1.75 billion dollars and will include improvements in tracks, stations, bridges, tunnels, signalling, and traffic control. In addition, there will be an expanded program of converting from diesel engines to electric engines; this will reduce pollution and save energy.

  A program is established for financing railroad rehabilitation and improvement. A fund of 1.6 billion dollars is provided, to be administered by the Secretary of Transportation.

- A two-year program of subsidies is provided for bankrupt freight and commuter branch lines in the Northeast and Midwest. Without this subsidy program, these bankrupt lines could be discontinued because the new legislation has not made them part of ConRail. This provision offers 100 percent Federal financing for the first year of the subsidy and 90 percent for the second year.

- Another Federal program of assistance to branch lines is also established by the law for a five-year period. This funding will be available to all states for the purchase or acquisition of bankrupt lines. This provision offers financing ranging from 100 percent for the first year to 70 percent for the fourth and fifth years.*

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*A fact sheet presenting full details on all provisions of the Railroad Revitalization and Regulatory Reform Act of 1976 is available from Office of Public Affairs, Federal Railroad Administration, Washington, D.C. 20590.

Other measures taken by the Federal government include enacting noise control legislation to reduce excess noise from snowmobiles, trucks, and airplanes and supporting for funding highway beautification projects.*

2. Then give specific examples of programs the Government is undertaking or has completed which are designed to achieve these objectives, such as:

Grants to cities, towns, and counties for the purchase of public transportation vehicles, such as buses--for example, a grant of 474,852 dollars to the County of Hawaii to assist in the purchase of ten new passenger buses, bus signs, and related equipment.

Grants and contracts to organizations to research the feasibility of a variety of energy-saving and environment-protecting modes of travel--for example, an award of 150,000 dollars to the Massachusetts Institute of Technology to provide research on control procedures for Dial-A-Ride, in which people phone the bus system requesting the bus stop at their house.

Surveys to learn how transportation facilities and vehicles can reduce negative effects on the environment--for example, a survey to determine the potential for increasing transportation energy conservation by strengthening international cooperative research programs. This is an attempt to learn from nations that long ago adjusted to the problem of a limited energy supply ideas that may be applicable in the United States. Interviews have been conducted with officials in France, West Germany, Sweden, Switzerland, and England.

Conferences in which national experts or officals gather to discuss solutions for some of transportation's harmful effects on the environment--for example, a national conference that was held on the railroads' role in meeting the nation's energy requirements. The two-day meeting brought together members of both public and private interest groups as well as the academic community.

Guidelines and requirements for industry prescribing certain behaviors that will reduce transportation's effects on the environment--for example, the Federal Aviation Administration has recommended new ground operating procedures for jets at airports to reduce engine emissions and conserve fuel. It recommended that four-engine jets shut down one or two engines while taxiing to the terminal after landing or during protracted holds before takeoff. Three-engine jets would shut down one engine.

Passage of legislation limiting some of transportation's harmful effects on the environment--for example, a law requiring the installation of emmission control devices on automobile exhausts and another reducing the speed limit to 55 mph. (Some of the other laws the government has

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*See Chapter III in this Manual, "Readings on Transportation and the Environment."

passed that are designed to reduce transportation's harmful effects on the environment are discussed in Activity #63 and in the readings.) In another example, the Refuse Act of 1899 prohibits the throwing, discharging, or depositing of any refuse matter into the waters of the United States to a distance of three miles from the coastline. The Federal Water Pollution Control Act prohibits the discharge of oil or hazardous substances into the waters of the United States to 12 miles off shore. And boaters are required by law to notify the U.S. Coast Guard if their vessel or facility discharges oil or hazardous substances into the water.

Demonstration projects which the government funds to learn about the feasibility of methods for reducing transportation's harmful effects on the environment--for example, a 600,000-dollar carpool demonstration project in Los Angeles in which a computer program will provide computer-printed match lists to interested persons within a five-county area who fill out an application form. The project's goal is to remove 888,000 vehicles traveling the highways each day, save 170 million gallons of gasoline a year, and reduce by 71,000 tons the amount of pollutants put into the air each year in the Los Angeles area.

Efforts to reduce the effects of and amount of noise pollution, for example:

- Passage of the Occupational Health and Safety Act which establishes a framework for regulating any and all workplace hazards including excessive noise exposure. Under this act, the Department of Labor and the Department of Transportation have both established regulations for drivers of commercial vehicles in terms of hours of service and noise levels generated by the vehicles at the operator station. For example, certain regulations pertain to the use of hearing protection devices for ground crews around military and commercial aircraft.

- Public Law 90-411 authorizes the Federal Aviation Administration to establish noise standards for aircraft. Such standards have been issued for a variety of new aircraft, resulting in quieter wide-body aircraft such as the 747, DC-10 and L-1011 plus the development of quieting kits for existing aircraft such as the 727, 737, DC-9, DC-8 and 707. Regulations are also being established (1974) to regulate ways in which all aircraft are to operate in the vicinity of airports to reduce noise exposure to adjacent communities.

- The Federal Highway Administration has established noise standards for the design and citing of all new interstate highways and for the design and approval of projects to reduce the noise from existing highways.

- The Department of Transportation is directing research and development activities to demonstrate quiet trucks and quiet tires for all vehicles on the highways in order to reduce transportation noises.

3. Finally, discuss with students the following issues:

Does it seem that the Federal government's actions are effective? How can you tell?

Are there other actions the government should be taking but isn't? If so, what are these actions? Why might the government not take these actions? What constraints may make it difficult for the government to take further action or to enforce the legislation it has enacted?

How can citizens help the Federal government to take effective actions to reduce transportation's harmful effects on the environment--for example, by attending hearings, by sending their opinions to government agencies and by getting involved in regional transportation planning efforts?

Evaluation Method:

Students describe the actions the government is taking to help resolve conflicts between transportation and the environment by role playing dialogues between "newspaper reporters" and government "public information officers" (government officials responsible for communicating government policies to the press and the public).

ACTIVITY #18

Mini-unit Topic: Solving Conflicts

Approximate Class Time: ½-1 period

Capsule Activity Description: Students discuss one or more solutions to conflicts between transportation and the environment.

Goal:

To be able to resolve conflicts between transportation and the environment.

Concepts Treated:

- Conflicts between transportation and the environment can often be resolved.
- Citizens need to develop the ability to resolve conflicts between transportation and the environment.

ACTIVITY

Have the class informally debate one or more of these issues.

- Resolved that the central business district should be off limits to automobiles all day Sunday and from 10 A.M. to 3 P.M. weekdays.
- Resolved that employees who ride to work in carpools should receive a tax rebate of 10 percent; should be provided with special high speed lane(s) for faster rush-hour commuting; etc.
- Resolved that 50 percent of all tax money from sales of gasoline and automobiles should be used to finance mass transit.
- Resolved that gasoline should be taxed 100 percent, rationed, or taxed *and* rationed.
- Resolved that all airports should be closed to air carrier traffic between 11 P.M. and 6 A.M.
- Resolved that the government should provide free public transportation to encourage citizens not to use their cars.
- Resolved that highway construction in the city reduces stop-and-go traffic and thereby reduces pollution.

- Resolved that local community groups should not be allowed to veto new transportation facilities (highways, airport expansion, etc.) when the latter benefit the entire community.
- Resolved that the state should ban billboards totally or from all limited access highways.
- Resolved that the speed limit for cars should be set uniformly.
- Resolved that an excise tax should be placed on the sales price of large cars or that large cars should be banned.
- Resolved that special lanes should be provided for buses or cars with three or more occupants.
- Resolved that owners of automobile junkyards should screen their operations from public view.
- Resolved that billboard advertising along public highways should not be restricted.

To ensure that as many of these topics as possible are carefully considered by the students, you can have students write a theme on one or more of the debate topics, taking a position and defending it. You can break the class into small groups, have each group select a different topic to debate, and require each group to attempt to reach a consensus regarding the issues involved and present its opinions to the class.

Evaluation Method:

Students select one of the debate topics not used during the activity and debate it until both sides agree on a resolution.

Variation and Supplementary Activity:

Students can research and debate the provisions of and effectiveness of environmental laws as they apply to transportation facilities and vehicles. Among the laws they can research are

The Clean Air Amendments of 1970*

The Highway Beautification Act of 1965*

The Noise Control Act of 1972*

The Federal Water Pollution Control Act Amendments of 1972

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*Explained in Chapter III of this Manual, "Readings on Transportation and the Environment."

The National Environmental Policy Act of 1969

The Freedom of Information Act

The Federal-aid Highway Act of 1970 (Section 136b)*

The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970

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*Explained in Chapter III of this Manual, "Readings on Transportation and the Environment."

ACTIVITY 19*

Mini-unit Topic: Solving Conflicts

Approximate Class Time: 1 period

Capsule Activity Description: Students discuss when to engage in citizen participation to oppose a harmful transportation effect on the environment or a feature of the environment which interferes with travel.*

Goal:

To be able to decide when citizens should engage in citizen participation to oppose a harmful transportation effect on the environment or a feature of the environment that interferes with travel.

Concepts Treated:

- There are many times when it is appropriate for the public to engage in citizen participation to oppose a harmful effect of transportation on the environment or to correct a hindrance to travel which is caused by the environment.
- Citizens need to be able to identify when citizen participation is justified to oppose a transportation vehicle or facility which has or will have harmful effects on the environment.
- Citizens need to develop the ability to resolve conflicts between transportation and the environment.
- Youngsters need to consider whether they should become involved in citizen participation to help solve conflicts between transportation and the environment and, if so, how.

ACTIVITY

Give students one of the scenarios provided on Spirit Master #3 or a scenario you or the students themselves develop for the activity. Have students write whether they feel the citizen affected in the scenario by the harmful transportation effect or feature of the environment has the right to engage in citizen participation to oppose or alter it and why.

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*This activity also appears in Mini-unit 6.

During the following class period, divide the students into small groups. Give them written instructions to read the papers of the other members of their groups and try to reach a consensus on

1. Whether the citizen described in the scenario is justified in taking action against the harmful transportation effect or feature of the environment

2. Why the citizen should or should not take action

3. What the nature of the transportation effect or feature of the environment would have to be--how serious or how many people affected--before citizen participation would be justified

Then have the groups describe their conclusions to the class, allowing other groups to comment on the presenting group's idea.

Raise for discussion (especially if you have used the last scenario on Ron Smith) whether young teenagers should engage in citizen participation designed to affect their community's actions regarding transportation and the environment. Why or why not? How can youngsters effectively get involved in citizen participation?

Finally, conduct a class discussion to decide when and if the following considerations would warrant citizen participation against the use of a vehicle or transportation facility which is having harmful effects on the environment or against a feature of the environment which interferes with travel safety, convenience, or enjoyment:

- How many people must be affected vs. how many are benefited?
- How much are the people harmed vs. how much are other people benefited?
- Did the affected people move into the area after the problem existed?
- Are there personal, inexpensive preventive measures citizens can take to reduce or eliminate the problem?
- Are there important transportation needs the mode of travel or facility meets that outweigh its harmful effects?
- Are there constraints--time, financial, technological--that make it difficult or impossible to solve the problem?

Evaluation Method:

Students decide whether citizens should engage in citizen participation for one of the scenarios on Spirit Master #3 which was not used during the activity.

MINI-UNIT 5

TAKING PERSONAL ACTION TO RESOLVE CONFLICTS BETWEEN TRANSPORTATION AND THE ENVIRONMENT

Mini-units 2 and 3 dealt with the effects of transportation on the environment and Mini-unit 4 involved identifying solutions to conflicts caused by these effects. This mini-unit deals with actions citizens can take to help resolve these conflicts.

The unit focuses specifically on actions individuals can take both in their own *personal behavior* and in their *relationships with other people*--their friends, relatives, and neighbors.

In the long run, knowing how the needs of transportation and the environment can conflict and being able to identify solutions for such conflicts are useless pieces of information unless they are *put into action* by citizens in their daily lives. This unit therefore focuses not only on what actions citizens can take in their personal lives and in groups, it also seeks to motivate them to take appropriate action. Further, by viewing the problem from the vantage point of adolescents who cannot drive, the activities explore options that may make it easier for these students to arrive at informed decisions in the future about balancing their use of automobiles and other modes of travel. The activities also encourage younsters to consider ways in which they can take actions to harmonize the relationship between transportation and the environment.

Key concepts treated in the unit include

- There are several positive actions the public can take to help reduce pollution and depletion of scarce energy resources resulting from excessive use of automobiles.
- Many people have strong motivation for not changing their travel habits in ways which would help the environment.
- Identifying these motives in ourselves and others is the first step in eventually altering our own and other people's travel behavior.
- Adolescents need to start thinking about their attitudes toward automobiles at an early age so that when they get their drivers' licenses they will use cars in ways which minimize damage to the environment.
- Citizens need to decide for themselves when it is appropriate to urge other people to change travel practices which harm the environment.
- There are effective methods by which citizens can often persuade one another to travel in ways which protect the environment and conserve scarce energy resources.

MINI-UNIT 5 LESSON PLAN

Taking personal actions to resolve conflicts between transportation and the environment

Activity #	*Activities*	*Class Time*
20[a]	DESCRIPTION: Students discuss what actions private citizens can take in their personal travel behavior to reduce the harmful effects of automobile use on the environment.[a] GOAL: To know what actions individuals can take in their personal travel behavior to reduce the adverse effects of automobiles on the environment.	½-1 period
21	DESCRIPTION: Students discuss America's alleged "love affair" with the automobile and how this may have affected patronage of public transportation. GOAL: To be aware of the many reasons people drive cars and of which reasons are appropriate.	½-1 period
22 Spirit Master #6	DESCRIPTION: Students examine their own attitudes toward changing their travel habits to reduce transportation's harmful effects on the environment. GOAL: To be aware of why people may be reluctant to change their travel habits.	½-1 period
23 Spirit Master #7	DESCRIPTION: Students discuss when it is appropriate to object to someone's use of transportation when it has detrimental effects on the environment GOAL: To be able to decide when it is appropriate for private citizens to object to the environmental consequences of another citizen's transportation practices.	½-1 period

[a]This activity also appears in Mini-unit 1.

MINI-UNIT 5 LESSON PLAN

Taking personal actions to resolve conflicts between transportation and the environment

Activity #	*Activities*	*Class Time*
24	DESCRIPTION: Students role play scenarios in which one person complains to another than his or her travel behavior is having narmful environmental effects. GOAL: To be familiar with several methods of persuading people to protect the environment in their travel behavior.	1 period

Total Class Time:
3-5 periods.

ACTIVITY #20*

Mini-unit Topic: Taking Personal Action

Approximate Class Time: ½-1 period

Capsule Activity Description: Students discuss what actions private citizens can take in their personal travel behavior to reduce the harmful effects of automobile use on the environment.*

Goal:

To know what actions individuals can take in their personal travel behavior to reduce the adverse effects of automobiles on the environment.

Concepts Treated:

- There are several positive actions the public can take which will help reduce pollution and depletion of scarce energy resources resulting from excessive use of automobiles.
- Citizens need to pinpoint actions they can take that are most beneficial to the environment in reducing automobile pollution.
- Youngsters need to consider whether adolescents their age who cannot yet drive have a role to play in reducing the harmful effects of automobiles on the environment.

ACTIVITY

Students write their responses to the scenario below:

The Mayor has just appointed you Commissioner of Transportation and the Environment for your community. He has asked you to come up with a plan of action that lists the *actions individual citizens can take to (1) reduce the effects of auto emissions on the environment and (2) reduce the extent to which cars use up energy resources.* The Mayor wants you to include in your report things young teenagers can do to help solve this problem.

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*This activity also appears in Mini-unit 1.

Then divide the class into small groups, instructing the members of each group to read each other's lists and discuss

1. Which actions you agree most citizens will voluntarily undertake and *why* you believe citizens would do so

2. Which actions citizens could be motivated to undertake, and *how* they could be motivated to do so

3. Which actions, if any, young teenagers could be motivated to undertake, and how they could be motivated to do so

4. Why some citizens will not take any action

Groups report conclusions to the class and respond to questions and comments from you and from the other groups. Raise for discussion any actions that students may have ignored:

1. Use public transportation whenever possible.

2. Use carpools and bicyles--and walk.

3. Maintain a car in optimum emission-reducing condition.

4. Use good driving habits, avoiding unnecessary emission-producing maneuvers (see suggestions listed at the end of the activity).

5. Buy unleaded gasoline.

6. Buy cars with the lowest levels of emissions.

Evaluation Method:

Students describe the actions the public can take in their personal travel behavior which will help reduce the harmful effects of automobiles on the environment and indicate why these actions would be effective.

GETTING THE BEST MILEAGE FROM YOUR GASOLINE

After you have selected the gasoline with the octane rating and the additives you need, you can take several precautions to improve performance and save gasoline.

First, to improve performance:

- Shop for a good mechanic. Check your friends and neighbors to see if they know one who is a specialist on your car.

- If you have your car serviced at a large agency, get acquainted with the service manager and see if you can have the same mechanic service your car every time.

- Be sure that a careful service record is kept on all repairs, so that the mechanic knows what work has been done before, and when.

- Follow the recommendations in your Owner's Manual for major and minor service and tune-ups.

Second, to save gasoline and conserve energy:

- Check your tire pressure at least once every month. Too low tire pressure increases rolling resistance, causes increased tirewear and reduces gasoline mileage.

- Periodically have your mechanic check the treadwear pattern of your tires to see if they are properly aligned. If they are out of alignment, the tires will wear excessively and your gasoline mileage will drop.

- If possible, avoid pressing your accelerator all the way down when climbing hills and long grades. It wastes gasoline.

- Avoid excessive high speed or jerky driving; learn to drive as smoothly and steadily as traffic and road conditions allow.

- Turn off your engine if you stop more than a minute. Restarting uses less gasoline than a minute's idling.

- Use the break rather than the accelerator to hold your car in place on a hill.

- Jumpy starts and fast getaways can burn over 50 percent more gasoline than normal acceleration.

- Avoid weaving, spurting and lane changing in heavy traffic. Such practices waste fuel.

- Look ahead and pace yourself to minimize stops at traffic lights and jam-ups.

- Slow down. Excessive speed is the greatest waster of gasoline. For best mileage do not exceed 50 miles per hour.

- Limit the use of auto air conditioners and other fuel consuming accessories.

- If you get a sudden drop in gasoline mileage, check with your mechanic. Trouble is brewing, and the sooner you have it fixed the less it is likely to cost you.

- Before you buy a new car, ask the dealer how many miles per gallon you can expect. These figures are now available for most models.
- Reduce the number of unessential auto trips through careful trip planning.
- Use mass transit, carpools or bicycles when feasible.

ACTIVITY #21

Mini-unit Topic: Taking Personal Action

Approximate Class Time: ½-1 period

Capsule Activity Description: Students discuss America's alleged "love affair" with the automobile and how this may have affected patronage of public transportation.

Goal:

To be aware of the many reasons people drive cars and of which reasons are appropriate.

Concepts Treated:

- Many people have emotional as well as practical reasons for driving cars.
- The harmful and beneficial effects of different transportation modes on the environment should be identified and considered in deciding how to travel.
- Adolescents should think about their attitudes toward automobiles at an early age so that when they get their drivers' licenses they will use cars in ways which minimize damage to the environment.

ACTIVITY

Students write their responses to the following instructions and scenario:

> It was the biggest event in my life. I had been looking forward to it for at least four years, and the last year was an agony of waiting for my dream to come true: a car! At last I'd be able to do all the things I'd been waiting for.

1. Do this young man's feelings reflect the way *you* now feel about the time when you will be able to drive? If *not*, write a few sentences summing up your own feelings on this score.

2. Write down all the reasons you think *this young man* was so eager to drive.

During the following class session, students divide into small groups and are given written instructions to read each other's papers and discuss one or more of the following issues:

1. What feelings you described in your statements about looking forward to driving

2. What responses you gave for why the young man was so happy to be able to drive

3. What other reasons people have for driving cars

4. Which of these reasons involve the use of cars as a necessity, a luxury, or an important means of transportation that *public transportation could not provide nearly as well*

5. Explanations for why people prefer cars to public transportation

6. Whether or not it is desirable and possible to change Americans' attitudes about cars, and if so, how

7. What arguments there are for using public transportation in certain circumstances rather than automobiles

8. How these arguments could be presented to the motoring public effectively and who should be responsible for educating the public to the importance of reducing its reliance on automobiles (or making more efficient use of the automobile) and increasing its use of public transportation

9. How these arguments could be presented to students between the ages of 11 and 14, in an effort to develop different attitudes toward their future use of automobiles

Groups report their conclusions to the class and respond to comments and questions from the class and you. Raise for discussion additional reasons some people have for preferring to travel by car rather than by public transportation, such as

- Privacy
- Convenience: door-to-door service
- Comfort: regulated heating, uncrowded, seats available
- Apparent cost effectiveness: no money is paid during most trips
- Speed: often less time-consuming than other travel modes
- Appearance: driver can "show off" his car
- Flexibility: can stop and get out or take side trips at will

Evaluation Method:

Students debate whether the activity has modified their own feelings of anticipation of the day when they will receive licenses to drive.

Variations and Supplementary Activities:

Students can poll friends and neighbors on reasons they wanted a driver's license when they became of age.

Students can discuss whether a reduction in the use of automobiles would have adverse effects on the economy and on employment.

Students can research and discuss the role automobile manufacturers and the highway lobby (a Congressional pressure group representing the trucking, automobile, highway construction, and other industries with interests in highway construction, maintenance, and improvement) may have played in encouraging America's alleged preoccupation with and preference for the automobile--for example, by analyzing automobile advertisements.

A representative of an automobile club or highway agency can be invited to class to respond to or expand on the students' conclusion.

ACTIVITY #22

Mini-unit Topic: Taking Personal Action

Approximate Class Time: ½-1 period

Capsule Activity Description: Students examine their own attitudes toward changing their travel habits in ways which will reduce transportation's harmful effects on the environment.

Goal:

To be aware of why people may be reluctant to change their travel habits.

Concepts Treated:

- Many people have powerful motives for not changing their travel habits in ways which would help the environment.
- Identifying these motives in ourselves and others is the first step in eventually altering our own and other people's travel behavior.

ACTIVITY

Tell the students that honesty about their feelings during this activity is essential to its success. Then have the students write responses to the instructions and scenario provided on Spirit Master #6. Next, divide the class into small groups and give them written instructions to read each other's responses and discuss

1. The reasons students who refused to take the action did so, and why those who agreed to take the action might, nevertheless, have been reluctant to do so. Members should feel free to probe each other's motives to ensure that the real reasons for abiding or refusing to abide are discussed.

2. Each reason for refusal or reluctance to take action in terms of how it could be overcome. Students might, for example, think of ways to overcome selfishness by showing evidence that in the long run taking action will be in their own best self-interest.

The groups report results to the class and respond to comments and questions. Raise for discussion reasons for inaction not mentioned

by students: for example, habit, laziness, selfishness, fatalism, ignorance (about what I can do or what the effects of my actions would be), lack of time, or suspicion the President is exaggerating the seriousness of the problem.

You can also introduce methods not mentioned by students for encouraging oneself (and others) to overcome these reasons for inaction, such as one's self-interest is served in the long run, if not in the short run; individual actions can help solve the problem, not only as a result of one's own actions, but by inspiring others by one's example to take similar action.

Conclude the activity by asking the students whether any of the attitudes and opinions they expressed regarding automobile travel may change when they are old enough to have drivers' licenses.

Evaluation Method:

Students describe the reasons most people have for using the travel modes they do instead of public transportation.

Variations and Supplementary Activities:

If discussing their own attitudes is threatening, students can discuss reasons other people may refuse to take personal actions.

Each student can describe in writing a desirable action citizens should take to reduce transportation's harmful effects on the environment. Students can exchange papers, and each student should explain to the author why he thinks people might be reluctant to engage in the activity and how their reluctance could be overcome.

ACTIVITY #23

Mini-unit Topic: Taking Personal Action

Approximate Class Time: ½-1 period

Capsule Activity Description: Students discuss when it is appropriate to object to someone's use of transportation which has detrimental effects on the environment.

Goal:

To be able to decide when it is appropriate for private citizens to object to the environmental consequences of another citizen's transportation practices.

Concepts Treated:

- Citizens need to decide for themselves when it is appropriate to urge other people to change travel practices which harm the environment.
- It is often difficult to persuade people to travel in environmentally appropriate ways.
- There are effective methods by which citizens can persuade one another to travel in ways that protect the environment and conserve scarce energy resources.

ACTIVITY

Give students one of the scenarios provided on Spirit Master #7 and have them write whether they feel the individual involved has a right to complain to the person who is allegedly polluting the environment.

During the following class session, divide the students into small groups and give them written instructions to read each other's papers and discuss

1. Whether the individual involved is justified in complaining to the person who is polluting, and why
2. If so, what methods for influencing the polluter would be most effective, and why

3. Whether individuals can reasonably be expected to take action against a polluter, and why

4. If individuals would not normally take such actions, how they could be motivated to do so

The groups then read the additional scenario and discuss it.

The groups report their conclusions to the class and respond to comments and questions from the class and you. Class discussion follows the criteria by which individual action against an alleged polluter is justified--for example, on the basis of the polluter's motives; cost to the polluter to stop polluting; employment problems for the polluter if he stops polluting; severity of pollution; number of people affected by the pollution; opportunity for aggrieved parties to avoid the pollution; benefits--that is, the same activity that pollutes may also confer benefits on society; and the age of the complainer--for example, if he or she is a young teenager.

In relation to this last possible criterion, ask your students to describe their feelings about making suggestions to their parents regarding issues like protecting the environment, not smoking, not drinking so much, and so on. Should young teenagers discuss these kinds of issues with their parents? Why or why not? How can they do so effectively?

Evaluation Method:

Students decide when it is appropriate for private citizens to object to the environmental consequences of another citizen's transportation practices. They make this decision using one of the scenarios on Spirit Master #7 which was not used during the activity.

Variations and Supplementary Activities:

Students can develop their own scenarios and exchange them with other groups.

Students can discuss when they feel it is appropriate to seek to eliminate or alter a feature of the environment when it hampers travel safety, convenience, or enjoyment.

ACTIVITY #24

Mini-unit Topic: Taking Personal Action

Approximate Class Time: 1 period

Capsule Activity Description: Students role play scenarios in which one person complains to another that his or her travel behavior is having harmful environmental effects.

Goal:

To be familiar with several methods of persuading people to protect the environment in their travel behavior.

Concepts Treated:

- Persuading people to travel in environmentally appropriate ways is often difficult.
- There are effective methods by which citizens can often persuade one another to travel in ways which protect the environment and conserve scarce energy resources.
- Citizens need to decide for themselves when it is appropriate to urge other people to change travel practices which harm the environment.

ACTIVITY

Students role play persons objecting to a neighbor, friend, or relative's travel behavior. Sample role profiles are provided on the following pages.

After each role play, the participants read their role profiles to the class and discuss the feelings they had while role playing--in particular, "neighbors," "friends," and "relatives" discuss their emotional reactions to different approaches on the part of the "complainer"--which approaches made them more likely to discontinue the practice being objected to. Nonparticipants discuss what they would have said had they been involved. Class should then be encouraged to write its own role profiles.

After the completion of role plays, list on the blackboard the possible approaches citizens can use in seeking to influence other

private citizens to discontinue harmful transportation practices. Finally, discuss whether it is *appropriate* for citizens--including youngsters--to object to other people's travel behavior on the grounds that it harms the environment and, if so, when and why.

Evaluation Method:

Students evaluate which techniques used in the role plays were most effective in persuading the participants to alter their travel behaviors to protect the environment and why.

Variation and Supplementary Activity:

Students can role play scenarios in which a citizen complains about a feature of the environment over which a friend or neighbor has control that is interfering with his or her travel safety, convenience, or pleasure. Students can use the final set of role profiles for this purpose and then develop additional ones of their own.

SAMPLE ROLE PROFILES

Complainer

Every summer you and your children like to swim in Placid Pond. It's a quiet, small pond, about ten acres in size. However, your neighbor is ruining your fun. He just bought a new motorboat which he takes out on Placid Pond and generally makes a racket. He makes sure not to endanger you when you and your children are swimming, but he still makes it miserable for you with the noise. You've decided he should go to a larger lake where other boats go, rather than disturb your little pond. You have gone over to his house this afternoon and have just sat down on his porch. What will you say?

Transportation User

You have just bought a new motorboat and what fun you are having with it! You take it out almost every day on Placid Pond for a spin. It's a very small lake, about 10 acres, but you can't take it to a bigger lake because you don't have a trailer to carry it. Besides, you like the quiet of Placid Pond, and the bigger lakes would have lots of swimmers and other boats for you to worry about. You suspect that your neighbors are annoyed by your boat, because some of them have given you "dirty looks" while they were swimming and you were driving around. One of your neighbors has just come over and sat down on your porch. You wonder if she is going to complain about your motorboat.

Complainer

You are the fourteen-year-old daughter of a mother who lives in the suburbs and works eight miles away in the city. You're upset with your mother because she drives all the way into town and back every day rather than take the bus. If she rode the bus, she would have to walk 3 blocks, wait 5-15 minutes, and pay 50¢ one way. But that's not so bad--you do it every weekend when you go into town to the movies. And it costs your mother $3.00 a day to park her car in town.

You think your mother is contributing to air pollution, wasting gasoline and ruining her nerves in the traffic. You've finally worked up the courage to confront her about it. You have just sat down to dinner. What do you say?

Transportation User

You live in the suburbs with your husband and two children, a fourteen-year-old daughter and a seventeen-year-old son. You drive to work in the city every day even though it's an eight mile drive, because you just hate to sit in those awful buses. Besides, you would have to walk three blocks to get to the bus and pay 50¢ each way. You'd rather pay the $3.00 a day to park in a lot in the city. You'd also have to stand and wait for each bus; they run only once every fifteen minutes during rush hour.

Your daughter has made remarks to you once in a while about how you're wasting gasoline and how you come home complaining about the traffic. Now that you've just sat down to dinner, she looks as though she's going to really let you have it. How will you justify using your car if she complains about it?

Complainer

You have joined a carpool at work in an effort to save gasoline and money. Many of the other people in the factory have done the same thing. It's even turned out to be fun! You get to chat with your co-workers on the way in and back, so the drive is more interesting than it used to be. But the guy who works at the bench next to you is still coming to work in his car, all the way from Hilville, 22 miles away. This really concerns you, because here you are doing your share to conserve gasoline and he's not. There are at least two other workers who could form a carpool with him, so you've decided not to keep your feelings to yourself. It's the morning coffee break and you have just approached him to suggest he join a carpool. What do you say?

Transportation User

You live in Hillville, a small town, and work about 20 miles away in a factory. You drive to work every day, even though many of your fellow workers use car pools. You drive your own car because you

can't stand to wait for someone to come pick you up, to wait for people to get together before you can leave work, and to drive out of your way to pick up other people. Each trip would take about fifteen minutes longer for you in a carpool. You'd also have to put up with the poor driving habits of some of your fellow workers. Anyway, as long as you pay for your gasoline, why should anyone care? But here comes that guy who works at the bench next to you who's always talking about his carpool. You wonder if he's going to say something about your not being in a carpool. He'd better not!

Complainer

You, Mr. (or Mrs.) Brown, noticed the other day that your neighbors, Mr. and Mrs. Green, have planted two four-foot hemlock trees on the corner of their property. In three years, you realize, the trees will be six feet tall. This concerns you because you have two small children who, in three years, will probably play in the street every now and then despite your best efforts to prevent this. When the trees grow they are going to make it very difficult for cars coming around the bend to see anyone in the street until it's too late.

There are many small children in the neighborhood, and you feel certain other parents may share your concerns. You have discussed the problem with your spouse and agreed to talk the matter over with the Greens. You spotted them this afternoon watering their trees and have walked over to see what can be worked out. Mr. and Mrs. Green have just given you a friendly "Hello!" What do you say?

Transportation Disturber

You, Mr. (or Mrs.) Green, have been upset for some time at the noise the passing traffic brings into your home. You also have a lovely living room picture window that opens out onto the busy street. So you both decided to plant two four-foot hemlocks in your yard to improve the view, to keep people from looking into your living room, and to keep out some of the sound. You bought and planted them five days ago and were told they would grow as much as a foot a year. You had considered buying bigger trees, but they were too expensive. Instead you spent 45 dollars apiece on these smaller ones--still a big investment for you.

You have noticed your neighbors, Mr. and Mrs. Brown, and their two small children, watching you on occasion as you water your trees. They seem upset, but you don't know why. In fact, Mr. (Mrs.) Brown is coming over right now as you water the trees. You like your neighbors and, wondering why they seem upset about your trees, greet them with a hearty "Hello!"

MINI-UNIT 6

EXPLORING HOW CITIZEN PARTICIPATION CAN HELP RESOLVE CONFLICTS BETWEEN TRANSPORTATION AND THE ENVIRONMENT

Mini-unit 5 focused on actions citizens can take both in their own personal behavior and in their relationships with other people to help balance the needs of transportation and the environment. This mini-unit concentrates on exploring social and political actions citizens can take to achieve this goal.

Citizen participation can be an effective method by which the public can help achieve socially desirable goals by assisting or motivating government agencies, private organizations, and businesses to harmonize interactions between transportation and the environment.

The unit focuses primarily on actions youngsters will be able to take *as adults* to reduce conflicts between transportation and the environment. Howe[illegible] consideration is also given in the activities to actions young teenage[illegible] can take *before* they become adults to resolve such conflicts.

Other key concepts this unit addresses include the following

- Citizens need to decide for themselves when it is appropriate to engage in citizen participation to promote harmony between transportation and the environment.
- There are many times when it is appropriate for the public to engage in citizen participation to eliminate a harmful effect of transportation on the environment or to oppose a feature of the environment which interferes with travel safety, convenience, or enjoyment.
- When engaging in citizen participation to resolve conflicts between transportation and the environment, citizens need to consider what effects their solutions may have on other aspects of community life, such as employment and town budgets.

MINI-UNIT 6 LESSON PLAN

EXPLORING HOW CITIZEN PARTICIPATION CAN HELP RESOLVE CONFLICTS BETWEEN TRANSPORTATION AND THE ENVIRONMENT

Activity #	*Activities*	*Class Time*
25[a] Spirit Master #3	DESCRIPTION: Students discuss kinds of citizen participation the public can engage in to balance the needs of transportation and the environment.[a] GOAL: To know what types of citizen participation the public can engage in to promote harmony between transportation and the environment	1 period
26[b] Spirit Master #3	DESCRIPTION: Students discuss when to engage in citizen participation to oppose a harmful transportation effect on the environment or a feature of the environment that interferes with travel.[b] GOAL: To be able to decide when citizens should engage in citizen participation to oppose a harmful transportation effect on the environment or a feature of the environment that interferes with travel.	1 period
27	DESCRIPTION Students discuss what kinds of citizen participation the public can engage in to reduce the transportation's harmful effects on the environment in their own community. GOAL: To know how to resolve conflicts between transportation and the environment in their own communities.	1 period

Total Class Time: 3 periods.

[a]This activity also appears in Mini-unit 1.

[b]This activity also appears in Mini-unit 4.

ACTIVITY #25*

Mini-unit Topic: Exploring Citizen Participation

Approximate Class Time: 1 period

Capsule Activity Description: Students discuss kinds of citizen participation the public can engage in to balance the needs of transportation and the environment.*

Goal:

To know what types of citizen participation the public can engage in to promote harmony between transportation and the environment.

Concepts Treated:

- Promoting harmony between transportation and the environment is often difficult.
- The public can engage in citizen participation which will effectively help balance transportation and the environment.
- Citizens need to decide for themselves when it is appropriate to engage in citizen participation to promote harmony between transportation and the environment.

ACTIVITY

Have students write what they would do to prevent the environmental problems described in one or more of the scenarios provided on Spirit Master #3.** Tell them for the time being not to consider whether they would or should take action, but to focus exclusively on what actions they *could* take which would be *effective* in solving the problems presented.

Read aloud several of the students' responses and record on the blackboard in outline form the major actions the students indicated they could take. Next, discuss for one or more of the proposed types of citizen participation

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*This activity also appears in Mini-unit 1.

**Since these scenarios are also applicable to Activity #26, you may want to save at least one scenario for use later with that activity.

- *Why* they would be effective
- Whether they would be *appropriate and justifiable* actions to take
- Whether most or any people confronted with these scenarios in real life *would actually undertake* these actions and why

Conclude the activity by asking the class to consider the merits and disadvantages of the following potential types of citizen involvement. Ask your students which, if any, of these methods of citizen participation young teenagers can engage in.

Writing letters or engaging in petition campaigns directed at (1) such regulatory agencies (Federal, state, local) as the Environmental Protection Agency (EPA), Federal Aviation Administration (FAA), and Civil Aeronautics Board (CAB); (2) politicians such as Congressmen, Senators, executives (e.g., President, mayor, governor, town manager); (3) local transportation agencies, such as mass transit authorities, port authorities, department of public works, department of highways; (4) state departments of transportation; (5) local consumer protection agencies; (6) media (T.V., radio, newspaper) "Action Lines"; and (7) letters to the editors of local newspapers. Such campaigns might be designed to achieve strong or stronger legislation on such issues as pollution controls for auto exhausts, strip mining, off-shore oil drilling, speed limits for cars, snowmobile use, auto traffic in the inner city, incentives for use of carpools, use of the Highway Trust Fund and other sources for financing mass transit, high taxation or rationing of gasoline, closing airports after a certain hour in the evening, airport expansion, new highway construction, billboards, automobile litter, manufacture and purchase of large cars, mph minimums for autos, free or inexpensive public transportation, and construction of subways. Alternatively, such campaigns might be aimed at strict enforcement of existing pollution laws through fines, imprisonment, and legislation.

Engaging in volunteer work with national or local environmental organizations can be effective.

Creating publicity to educate the public on issues suggested above, by means of advertisements, editorials, and feature articles in local newspapers, monthly city magazines, newsletters of community groups and unions; lectures; fact sheets and leaflets; demonstration projects; and public service announcements on radio and television.

Giving talks to clubs and organizations--fraternal societies (Elks, Masons, etc.), youth groups (Boy Scouts, Girl Scouts, etc.), and civic groups (Kiwanis, Rotary, etc.) may be effective public relations.

Organizing meetings with public and private officials and with government agencies and private companies to encourage them to adopt specific actions or discontinue current practices in order to reduce transportation's harmful effects on the environment. (See examples of agencies and objectives above.)

Publicizing and organizing actions at one's place of employment, e.g., formation of carpools as company policy with an incentive system; provision of company shuttle bus to and from nearest public transportation facility during rush hour; subsidization of employees' transit fares and charging a fee for use of company parking facilities; and the provision of free parking to carpool drivers only.

Participating in transportation planning through such actions as becoming involved in the planning of Federal-aid highway projects or in the formulation of environmental impact statements. The Federal Highway Administration (FHWA) works with state highway agencies to ensure that community organizations and individual citizens are actively encouraged to participate in the planning and design of Federal-aid highway projects. Under the Federal aid program, state highway agencies initiate, plan, design, build, and operate highway projects. (The FHWA provides financial assistance and guidance and is responsible for certain key approvals.) Each state highway agency has formulated a community involvement program--part of the state's action plan--which explains the procedures that are followed.*

In addition to community involvement programs, each action plan explains how social, economic, and environmental factors are identified and studied, how the assistance of a wide range of professional skills is obtained and utilized, and how consideration of all feasible alternatives is assured in the highway planning process. Copies of action plans are available from state highway agencies or can be examined in their offices.

Action plan programs for community involvement include opportunities for interested citizens to participate in the planning and design process. In addition to public hearings, most states place emphasis on public meetings. Frequently such meetings are conducted as workshops run with the assistance of local officials and agencies. In many instances coordination meetings are held with local officials prior to the public meetings.

Under state action plans, mailing lists are maintained to provide early notification and continued information to known interest groups and individuals. Concerned citizens may contact their state highway agencies and ask to have their names placed on these mailing lists.

To ensure that environmental concerns and values are given systematic consideration equal to economic and technical considerations in the Federal decision-making process, the National Environmental Policy Act of 1969 (NEPA) requires each Federal agency to prepare a statement of

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*For further information see readings in Chapter III of this Manual and write for copies of *Getting Involved in Transportation* (U.S. Department of Transportation, Office of Consumer Affairs, 400 7th and D Streets, S.W., Washington, D.C. 20590) and *In Productive Harmony: Environmental Impact Statements Broaden the Nation's Perspectives* (U.S. Environmental Protection Agency, Washington, D.C. 20460).

environmental impact in advance of each major action, recommendation, or report on legislation that may significantly affect the quality of the human environment. Such actions may include new highway construction, harbor dredging or filling, nuclear power plant construction, large-scale aerial pesticide spraying, river channeling, new jet runways, munitions disposal, and bridge construction.

Each environmental impact statement must assess in detail the potential environmental impact of a proposed action, and all Federal agencies are required to prepare statements for matters under their jurisdiction.

The statement's primary purpose is to disclose the environmental consequences of a proposed action, thus alerting the agency decision maker and the public to the environmental risks involved.

As early in the decision-making process as possible, and in all cases prior to agency decision, an agency prepares a draft statement for review by appropriate Federal, state, and local environmental agencies as well as by the public.

The impact statement procedure affords the public an opportunity to participate in Federal decisions that may affect the human environment. Each draft statement must be made public by the responsible agency at the time it is circulated for comment, a date not less than 90 days before the proposed action. Draft statements are announced in the *Federal Register* (published daily by the U.S. government and subscribed to by some local public library systems, many university libraries, and most law libraries).

After comment from the agencies and interested parties, the statement is prepared in final form, incorporating all comments and objections received on the draft and indicating how significant issues raised during the commenting process have been resolved. Both draft and final statement are made available to the public.

Interested citizens may submit comments to agencies on any impact statement issued. If an individual believes a draft statement to be inadequate, he may offer written comments on the draft. If he believes the dispostion of his comments in the final statement to be inadequate, he may so notify the agency involved.

In addition to these mechanisms for public participation, many agencies provide for public hearings not only at various stages during the performance of their statutory missions but during the impact statement process itself.

The importance of the role citizens play in the impact statement process has been recognized by the courts. In many cases, the courts have upheld the right, or standing, of citizens to sue on environmental grounds.

Participating in demonstrations, such as picketing, rallies, sit-ins, and boycotts.

Initiating court action, such as civil action against any citizen, government agency, or government for violation or failure to enforce existing legislation--e.g., the Noise Control Act of 1972 or the Clean Air Act of 1970; and injunctions, through class action or personal suits, against industries and government agencies who pollute or plan to build or operate facilities that will have adverse effects on the environment.

Also discuss what constraints citizens must expect to cope with in attempting to take action, such as the positive effects of transportation on the environment, the social and personal needs transportation meets, and the human and economic costs involved in reducing or eliminating transportation's harmful effects on the environment. The goal of citizen action is to resolve conflicts and create harmony among the conflicting priorities of society, transportation, and the environment.

Evaluation Method:

Students describe the types of citizen action the public can engage in which will effectively solve the conflicts presented in one of the scenarios on Spirit Master #3 that they did not use during the activity.

ACTIVITY #26*

Mini-unit Topic: Exploring Citizen Participation

Approximate Class Time: 1 period

Capsule Activity Description: Students discuss when to engage in citizen participation to oppose a harmful transportation effect on the environment or a feature of the environment that interferes with travel.*

Goal:

To be able to decide when citizens should engage in citizen participation to oppose a harmful transportation effect on the environment or a feature of the environment that interferes with travel.

Concepts Treated:

- There are many times when it is appropriate for the public to engage in citizen participation to eliminate a harmful effect of transportation on the environment or to oppose a feature of the environment that interferes with travel safety, convenience, or enjoyment.
- Citizens need to be able to identify when citizen participation is justified to oppose a transportation vehicle or facility which has or will have harmful effects on the environment.
- Citizens need to develop the ability to resolve conflicts between transportation and the environment.
- Youngsters need to consider whether they should become involved in citizen participation to help solve conflicts between transportation and the environment and, if so, how.

ACTIVITY

Give students one of the scenarios provided on Spirit Master #3 or a scenario you or the students themselves develop for the activity. Have students write whether they feel the citizen affected in the scenario by the harmful transportation effect or feature of the environment has the right to engage in citizen participation to oppose or alter it and why.

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*This activity also appears in Mini-unit 4.

During the following class period, divide the students into small groups. Give them written instructions to read the papers of the other members of their group and try to decide

1. Whether the citizen described in the scenario is justified in taking action against the harmful transportation effect or feature of the environment

2. Why the citizen should or should not take action

3. What the nature of the transportation effect or feature of the environment would have to be--how serious, how many people affected, etc.--before citizen participation would be justified

Then have the groups describe their conclusions to the class, allowing other groups to comment on the presenting group's ideas.

Raise for discussion (especially if you have used the last scenario on Ron Smith) whether young teenagers should engage in citizen participation designed to affect their community's actions regarding transportation and the environment. Why or why not? If so, how can youngsters effectively get involved in citizen participation?

Finally, conduct a class discussion to decide whether or when the following considerations warrant citizen participation against the use of a vehicle or transportation facility which is having harmful effects on the environment or against a feature of the environment which interferes with travel safety, comfort, or convenience:

- How many people must be affected vs. how many are benefited?
- How much are the people harmed vs. how much are other people benefited?
- Did the affected people move into the area after the problem existed?
- Are there personal, inexpensive preventive measures citizens can take to reduce or eliminate the problem?
- Are there important transportation needs the mode of travel or facility meets that outweigh its harmful effects?
- Are there constraints--time, financial, technological--that make it difficult or impossible to solve the problem?

Evaluation Method:

Students decide whether citizens should engage in citizen participation in one of the scenarios provided on Spirit Master #3 that was not used during the activity.

ACTIVITY #27

Mini-unit Topic: Exploring Citizen Participation

Approximate Class Time: 1 period

Capsule Activity Description: Students discuss what kinds of citizen participation the public can engage in to reduce transportation's harmful effects on the environment in their own community.

Goal:

To know how to resolve conflicts between transportation and the environment in their own communities.

Concepts Treated:

- There are often types of citizen participation the public can engage in which will effectively resolve conflicts between transportation and the environment in their own community.
- When engaging in citizen participation to resolve conflicts between transportation and the environment, citizens need to consider what effects their solutions may have on other aspects of community life, such as employment and town budgets.

ACTIVITY

Students identify a harmful transportation effect on the environment in their own community that clearly should be reduced or eliminated. Then divide the class into small groups and instruct them to discuss and agree on

1. What constraints may make it difficult to reduce this effect--for example, does it benefit some other people or will it be expensive to reduce the effect?

2. What harm may be done in reducing or eliminating the effect--for example, loss of jobs, or increased taxes?

3. What political and social actions could citizens initiate to reduce this effect?

4. What actions can young teenagers undertake to reduce this effect?

5. If nothing is being done at this time to solve the problem, why not?

6. What, if anything, can be done to encourage people to become involved in solving conflicts between transportation and the environment in their own community?

The groups report conclusions to class and respond to questions and comments from the class and you. Then raise for discussion any actions that students may have ignored, such as those suggested in Activity #25.

Evaluation Method:

Students repeat the activity using a different community conflict between transportation and the environment.

Variations and Supplementary Activities:

Students can examine their own community to learn whether any citizen groups are aware of the existing harmful transportation effect on the environment which they have identified. If so, students can research the citizens groups' actions and report their findings to the class.

Students can participate in such citizen groups and report their experiences to the class.

MINI-UNIT 7

RESEARCHING ISSUES RELATED TO TRANSPORTATION AND THE ENVIRONMENT

This final mini-unit consists of three research activities. Individual students can pursue those activities which interest them, or the class can be divided into small groups with each group pursuing a different research activity. Finally, the activities can be used as extra credit assignments or as independent study exercises for students who wish to learn more about transportation and environmental issues on their own.

The activities deal in logical fashion with three different aspects of transportation and the environment. The first focuses on the harmful effects of transportation on the environment; the second treats public attitudes about how to cope with those effects; the third suggests rail travel, buses, and carpools as methods to reduce those effects.

Key concepts addressed in the unit include the following:

- Citizens need to be aware of the public's attitudes toward conflicts between transportation and the environment in order to promote resolutions which will meet with public support.
- Several different modes of travel need to be considered as potential alternatives to the single-occupant automobile for certain inter- and intracity trips.

By engaging in these research activities independently or in small groups students will be able to share what they learn about these major transportation and environmental issues and pool their combined knowledge into a comprehensive understanding of the relationship between transportation and the environment in America today.

MINI-UNIT 7 LESSON PLAN

Researching issues related to transportation and the environment

Activity #	*Activities*	*Class Time*
28	DESCRIPTION: Students take field trips to different agencies and individuals to learn about transportation's effects on the environment. GOAL: To know what the effects are of transportation on the environment.	2-3 periods, plus out-of-class time
29	DESCRIPTION: Students poll the public on its knowledge about and attitudes toward conflicts between transportation and the environment. GOAL: To know what the public's attitudes are toward conflicts between transportation and the environment.	2-4 periods, plus out-of-class time
30	DESCRIPTION: Students research the other transportation modes as personal travel alternatives to automobiles. GOAL: To be able to decide when people should travel by carpools, rail or bus.	2-3 periods, plus out-of-class time

ACTIVITY #28

Mini-unit Topic: Researching Transportation and the Environment

Approximate Class Time: 2-3 periods, plus out-of-class time

Capsule Activity Description: Students take field trips to different agencies and individuals to learn about transportation's effects on the environment.

Goal:

To know what the effects of transportation are on the environment.

Concepts Treated:

- Transportation has many different effects, both positive and negative, on the environment.
- Various features of the environment sometimes interfere with travel safety, comfort, and convenience.

ACTIVITY

Students investigate three different aspects of transportation and the environment in this activity.

First, the class lists the different *sources* of transportation's harmful effects on the environment, such as automobiles, airplanes, boats, trucks, truck terminals, buses, and recreational vehicles. Students then identify individuals and agencies in the community who are in a position to provide information about the environmental effects of these vehicles or facilities, such as vehicle manufacturers, vehicle salespersons, automobile mechanics, transportation planners, terminal operators, and air pollution control monitors.

Students then list ways in which transportation can benefit the environment and identify agencies and individuals they can visit who can provide information on this aspect of the relationship between transportation and the environment. Students can consider visiting crop-spraying companies, garbage truck manufacturers and companies, rain-making companies, touring agencies, departments of public works and highways, and highway, bridge, and gas station engineering and architecture companies.

Finally, students list ways in which features of the environment can affect travel safety, convenience, and enjoyment and then identify agencies and industries they can visit which will have information on how these environmental features affect travel. Sample individuals and agencies who might have such information include owners and operators of automobile junkyards and "graveyards"; departments of public works and highway officials responsible for highway sign production and installation; recreational and natural wildlife authorities whose property causes a detour in highway construction; and advertising companies and business officials whose advertisements appear on highway billboards.

After identifying these three categories of individuals and agencies, students decide whom they would like to visit, and divide into small groups formed around each agency or individual that will be visited. Each group then develops a list of questions it would like answered by the official(s) or agency it plans to visit.

1. What effects on the environment did this facility, object, or mechanism (for example, automobile exhaust system, billboard, etc.) formerly produce that it no longer produces.

2. How were these effects reduced or eliminated?

3. Do certain facilities, mechanisms, or objects (e.g., airplanes, tall trees) still have any adverse effects on the environment? If so, what effects?

4. What, if anything, is being done now to reduce or eliminate harmful effects transportation may be having on the environment?

5. What are the obstacles which prevent or make it difficult to reduce these harmful effects?

6. What is the government doing, if anything, to reduce or eliminate these effects? What laws are designed to assist in this process?

7. What can private citizens do to reduce these effects?

During their visits, groups take notes and collect agency or company literature if available. After the visits, groups meet to discuss

1. What, specifically, they learned about transportation's effects on the environment or the effects of features of the environment on travel safety, comfort and convenience

2. Whether they think the individuals or agencies they visited seem to be doing all they can about reducing the harmful effects of transportation on the environment and eliminating features of the environment which interfere with travel; and if not, why not

The groups conclude the activity by preparing and presenting reports of their findings to the class and responding to comments and questions from other groups and you.

Evaluation Method:

Students present information about transportation's effects on the environment in role-played dialogues between an "official" of an agency they visited and a "visitor" to that agency who is inquiring about these effects.

ACTIVITY #29

Mini-unit Topic: Researching Transportation and the Environment

Approximate Class Time: 2-4 periods, plus out-of-class time

Capsule Activity Description: Students poll the public on its knowledge about and attitudes toward conflicts between transportation and the environment.

Goal:

To know what the public's attitudes are toward conflicts between transportation and the environment.

Concepts Treated:

- The extent to which conflicts between transportation and the environment can be resolved depends to a large extent on public awareness of the conflicts and willingness to help resolve them.
- Citizens need to be aware of the public's attitudes toward conflicts between transportation and the environment in order to promote resolutions which will meet with public support.

ACTIVITY

A small group of students develops a list of questions to ask about transportation's effects on the environment, about the effects of various features of the environment on travel safety, convenience, and comfort, and about its attitudes toward resolving conflicts between transportation and the environment. Before developing its questions, the group decides whom to poll--for example, other students, faculty, residents of the community, or people in specific agencies or companies. The group then develops its questions, using, if it wishes to, the sample questions (Survey A) provided at the end of the activity. The group submits its questionnaire to the rest of the class as a "dry run" to identify ambiguous or confusing questions.

The group revises its questionnaire based on the results of the "dry run" and then decides how many respondents to poll and how to contact them (for example, door-to-door or on the street). The group divides responsibility for asking the questions (for example, students can conduct the poll individually or in groups of two) and conducts the poll.

After conducting the poll, the group tabulates its findings and records the answers to the following questions:

1. What information does the public have about conflicts between transportation and the environment? What information does it lack?

2. What are the public's attitudes toward resolving these conflicts?

3. What are the implications of this knowledge and these attitudes for the success of government programs and citizen action to resolve conflicts between transportation and the environment?

After completing its study, the group reports its findings to the other students in the class and responds to comments and questions.

Evaluation Method:

Students illustrate public attitudes toward conflicts between transportation and the environment in role-played dialogues of a "television interviewer" questioning a "person-in-the-street" regarding his or her views on the issue.

Variation and Supplementary Activity:

Students can poll citizens on how they feel transportation's harmful and beneficial effects involve them personally. A sample questionnaire (Survey B) is provided at the end of the activity.

SURVEY A

Sample poll questions on the public's general knowledge of and attitudes about conflicts between transportation and the environment

Sex: M F

Age: under 14 14-17 18-21 22-29 30-49 49-59 over 59

Do you own a:

☐ Car

☐ Truck

☐ Recreational vehicle (boat, snowmobile, etc.)

(Check all that apply.)

---

1. In general, what kind of effects do you feel transportation--cars, planes, boats, highways, etc.--have on the environment? (Circle one.)

   all good mostly good some good, some bad mostly bad all bad

2. In what ways, if any, do you feel transportation has harmful effects on the environment? (Check any of the following which interviewees mention.)

   ☐ Air

   ☐ Water

   ☐ Use of land

   ☐ Use of energy resources

   ☐ Noise

   ☐ Things we see, look at

   ☐ People moving to different parts of town or state

   ☐ Other (write in): _____

3. In what ways, if any, do you feel using transportation vehicles can have beneficial effects on the environment? (Check any of the following

which interviewees mention.)

- ☐ City highways relieving city traffic congestion
- ☐ Highways in cities reducing stop-and-go (highly polluting) traffic
- ☐ Pollution monitoring
- ☐ Fighting forest fires
- ☐ Insect control
- ☐ Forest seeding and fertilizing
- ☐ Airlifting food to stranded livestock
- ☐ Garbage collection
- ☐ Enabling people to view scenery and visit parks
- ☐ Crop spraying
- ☐ Weather control
- ☐ Other (write in): _____

4. Do you feel there is anything you as a private citizen can do to help reduce transportation's harmful effects on the environment? (Circle one.)

   Yes No

5. Under what circumstances would you use a car less? (Check one or more.)

- ☐ If a carpool to work were available
- ☐ If there were more public transportation
- ☐ If there were cheaper public transportation
- ☐ If there were safer public transportation
- ☐ If highways provided express lanes for buses
- ☐ If gasoline cost a lot more
- ☐ If I had to pay $5.00 a day to park my car at work
- ☐ Other (fill in): _____

6. Do you feel there is anything the government can do to help reduce transportation's harmful effects on the environment? (Circle one.)

   Yes No

7. If the government placed some restrictions on when or how often you could travel--for example, banned Sunday driving-- would you feel: (Check one.)

- ☐ Pleased the government took action.
- ☐ Somewhat annoyed
- ☐ Very angry
- ☐ Indifferent

8. Do you have any other comments on transportation's effects on the environment?

_____

_____

_____

_____

SURVEY B

Sample poll questions on how conflicts between transportation and the environment directly affect the public

Do you live on or near: (Check all that apply.)

☐ A busy street or highway

☐ An airport

☐ A river or lake

---

1. Are you bothered by automobile exhaust fumes? (Check one.)

   ☐ Not at all ☐ Some ☐ A lot

2. If you are bothered by automobile exhaust fumes, why? (Check all that apply.)

   ☐ They're just unpleasant for me

   ☐ They make my eyes water

   ☐ They make me nauseous

   ☐ They give me headaches

   ☐ I feel they are unhealthy for me

   ☐ They harm my plants and shrubbery

   ☐ They are killing animals in the zoo

   ☐ They bother my pets or livestock

   ☐ They dirty my clothing

   ☐ Other (specify): _____

3. Are you bothered by airplane, car, or truck noise? (Check one.)

   ☐ Not at all ☐ Some ☐ A lot

4. If you are bothered some or a lot by airplane, car, or truck noise, why? (Check all that apply.)

   ☐ It's just unpleasant for me

   ☐ It hurts my ears

☐ It may damage my house

☐ It disturbs my sleep

☐ It seems to be making me hard of hearing

☐ It makes conversation difficult

☐ It makes it difficult to concentrate

☐ Other (specify): _____

5. Do any features of the environment interfere in any way with your travel safety, comfort, or enjoyment--for example, do billboards or street litter bother you or does a detour around a park or wildlife reservation bother you? (Check one.)

☐ Not at all ☐ Some ☐ A lot

6. Does transportation have any beneficial effects on the environment which benefit you personally? (Check all that apply.)

☐ Forest fire fighting

☐ Crop spraying

☐ Insect control

☐ Garbage collection

☐ Airlifting food to stranded livestock

☐ Touring scenic places

☐ Forest seeding

☐ Rain making

☐ Monitoring pollution

☐ Highways drawing off traffic from the city

7. Do you have any other comments on how transportation's effects on the environment involve you personally?

_____

_____

_____

_____

_____

ACTIVITY #30

Mini-unit Topic: Researching Transportation and the Environment

Approximate Class Time: 2-3 periods, plus out-of-class time

Capsule Activity Description: Students research other transportation modes as personal travel alternatives to automobiles.

Goal:

To be able to decide when people should travel by carpools, rail, or bus.

Concepts Treated:

- Citizens need to become familiar with the availability of travel options to the automobile in their communities and of the advantages and disadvantages of traveling by these other modes.
- Several modes of travel should be considered as potential alternatives to the single-occupant automobile for certain inter- and intracity trips, including rail, bus, and carpools.

ACTIVITY

A small group of students studies the desirability and availability of using carpools, trains, and buses as alternate means of travel to cars.

The group begins by formulating questions it would like answered. Sample questions include

1. What kinds of passenger rail travel, public transportation, and carpools are available in our community?
2. How convenient would it be to use these travel modes for different purposes in our community?
3. How expensive, compared to other modes of travel, would it be to travel by bus, rail, and carpools to reach various destinations?
4. How used or underused are the railroads and buses in our community? If they are underused, what might account for this?

5. Is the community aware of the availability, convenience, and cost of bus, carpool, and rail travel? If not, should they be informed of it and if so, how?

6. Do buses, railroads, and carpools have fewer adverse affects on the environment than cars? If so, in what ways?

Next, students identify research methods for answering the above questions, such as interviews and polls of citizens, politicians, transportation agency administrators, and railroad and bus officials; reading; telephone calls to train stations; field trips to railroad and bus stations; and riding on a train and bus. Then the group divides responsibility for the research and conducts it.

After completing the research, the group prepares and presents a report to the class which includes information about rail, carpool, and bus service available in the community and recommendations for or against increased use of carpools, buses, or railroads. The group responds to comments and questions from the class and you.

Evaluation Method:

Students develop a promotional booklet advocating increased use of railroads, buses, or carpools, where appropriate, in their community. The booklet also discusses the disadvantages of using these travel modes, if applicable.

Variations and Supplementary Activities:

If no passenger railroad or bus service exists in the community, students can investigate whether this was always the case and what, if anything, can and should be done to remedy the situation.

Students can research the role of railroads in shipping goods and compare railroad shipping costs and efficiency with those of trucks.

Students can research the Federal government's attempt, through Amtrak, to revive use of railroads for passenger transportation (see Activity #17).

SUPPLEMENTARY ACTIVITIES

Activities 31-39 which follow can be used either in conjunction with one of the mini-units or individually, by themselves. They have not been included in the mini-units because

- Some treat the same topic areas as do activities in the mini-units--but do so in a different manner or at a different level.
- Some involve more time or preparation than many teachers will be able to devote to transportation and the environment--but are excellent activities for the teacher who does have the time.

Activity 37 provides a general student evaluation of whatever course you present to your class on transportation and the environment.

Activity 39, the last activity, suggests quiz questions you can use after teaching one or more of the mini-units or individual activities.

LESSON PLAN

Supplementary activities

Activity #	*Activities*	*Class Time*
31	DESCRIPTION: You and your students evaluate class interests in studying transportation and the environment.	½-1 period
32	DESCRIPTION: Students develop and play word games using transportation and environmental terms and concepts. GOAL: To be familiar with several of the effects that transportation has on the environment.	½-2 periods
33	DESCRIPTION: The class discusses the beneficial ways in which aircraft are used in relation to the environment. GOAL: To know what beneficial uses aircraft have for the environment.	½-1 period
34	DESCRIPTION: Students create collages illustrating beneficial and harmful effects transportation vehicles and facilities can have on the environment. GOAL: To know some of the beneficial and harmful effects transportation vehicles and facilities can have on the environment.	2-3 periods

LESSON PLAN (CONTD.)

Supplementary activities

Activity #	*Activities*	*Class Time*
35	DESCRIPTION: Students discuss what individuals can do to persuade others to reduce transportation's harmful effects on the environment. GOAL: To know when and how to persuade other people to modify their travel habits to protect the environment.	1 period
36	DESCRIPTION: Students discuss actions individuals can take to avoid transportation's harmful effects on the environment that affect those same individuals personally. GOAL: To be able to identify actions people can take to avoid unpleasant transportation effects	1-2 periods
37	DESCRIPTION: Students evaluate the course.	½-1 period
38	DESCRIPTION: You and your students evaluate student attitudes toward issues related to transportation and the environment.	½-½ period

LESSON PLAN (CONTD.)

Supplementary activities

Activity #	*Activities*	*Class Time*
39	DESCRIPTION: Students respond to written or oral questions about issues related to transportation and the environment.	½-1 period

ACTIVITY #31

Supplementary Activity

Approximate Class Time: ½-1 period

Capsule Activity Description: You and your students evaluate class interests in studying transportation and the environment.

ACTIVITY

Students answer questions designed to reveal their interests in transportation and the environment. Sample questions are provided on the following pages.

The interest questionnaire should be answered anonymously to allow students to feel free to express their feelings. Tell the class that there are no right and wrong answers to the questions; they are simply designed to help you identify what aspects of transportation and the environment the students should study.

STUDENT INTEREST QUESTIONNAIRE

1. Do you have problems with any of the following transportation effects on the environment? Such problems might affect your health, your plants, your opportunities for recreation, and so on. (Check all that apply.)

Transportation Effect	*No Problems*	*Some Problems*	*Many Problems*
Air pollution from trucks			
Air pollution from cars			
Noise pollution from cars			
Noise pollution from trucks			
Noise pollution from airplanes			
Noise or air pollution from trains			
Noise pollution from recreational vehicles (snowmobiles, etc.)			
Water pollution from boats			
Dirt pollution from cars or trucks			
Dirt pollution from planes			
Unpleasant sights created by transportation facilities			
Litter, loud muffler noises, and other annoying or harmful effects of transportation that result *from the way people use* cars, boats, etc., rather than from the vehicles themselves			

2. Do you have problems with any of the following features of the environment which may affect travel? (Check all that apply.)

Environmental Feature	*No Problems*	*Some Problems*	*Many Problems*
Litter			
Commercial signs			
Confusing directional signs			
Automobile "graveyards"			
Poor visibility due to trees, hills, etc.			
Railroad crossing hazards			
Animals			

3. How much do transportation vehicles (e.g., cars) or facilities (e.g., gas stations, etc.) affect you in the following ways? (Check all that apply.)

Type of Effect	*Not at All*	*Some*	*A Lot*
Your health			
Your concentration			
Your hearing			
Keeping things clean			
Using up land you would like used for something else, like a park			
Your plants, trees, livestock, etc.			
The amount of gasoline available for driving			

4. The best way to solve these problems is (check all that apply)

- ☐ None of them can be solved
- ☐ By getting honest politicians
- ☐ By educating the public
- ☐ By passing laws to correct abuses
- ☐ By letting everyone solve his own problems
- ☐ By citizens protesting
- ☐ Through citizen involvement in transportation planning
- ☐ Other (specify):

_____

_____

_____

_____

5. A course on transportation and the environment could help me most if it dealt with the following specific transportation and environmental topics (specify):

_____

_____

_____

_____

_____

_____

_____

A course on transportation and the environment could help me most if it let me study what I want, but assisted me to do so effectively by (specify):

_____

_____

_____

_____

_____

A course on transportation and the environment could help me most if it used the following learning methods (check all that apply):

- ☐ Art
- ☐ Audiovisual
- ☐ Debates
- Discussions
  - ☐ Small groups
  - ☐ Class
- Drama
  - ☐ Role plays
  - ☐ Games
- ☐ Field trips
- ☐ Independent study
- ☐ Interviews
- ☐ Lectures
- ☐ Polls
- ☐ Reading
- ☐ Research
- ☐ Teaching peers
- ☐ Volunteer work
- ☐ Writing

ACTIVITY #32

Supplementary Activity

Approximate Class Time: ½-2 periods

Capsule Activity Description: Students develop and play word games using transportation and environmental terms and concepts.

Goal:

To be familiar with several of the effects that transportation has on the environment.

Concepts Treated:

- Transportation has significant effects on the environment.
- Some of transportation's effects are beneficial while others are harmful.
- The environment can facilitate or hamper travel safety, convenience, expense, and enjoyment.

ACTIVITY

Give your students a list of options for word games they can create and then play in small groups. They add games of their own to the list and then select the one(s) they would most like to create. Samples include

- Scrabble
- Unscrambling words
- Unscrambling sentences
- Twenty questions
- Riddles

An example of each game follows. Examples may be played by students to gain a feel for how to develop games of their own. Encourage the class to include in its games not only concepts and terms related to transportation's harmful effects on the environment but also concepts related to the beneficial effects of transportation on the environment and the effects features of the environment have on travel safety, comfort, and convenience.

Evaluation Method:

Games are self-evaluating.

Variation and Supplementary Activities

You or your students can collect records, lyrics, and tape recordings of songs involving transportation's effects on the environment and analyze their message. Sample songs about transportation's effects include:

Cement Octopus (Pete Seeger, "God Bless the Grass," Columbia Records (CS 9232)

Where Do the Children Play (Cat Stevens, "Tea for the Tillerman," (A & M Records, SPY 280)

Air (from the album "Hair," RCA LSO-1150)

Scrabble

A student who makes a word must be able to define it to get credit. Player gets no credit for a word he or she can't directly relate to transportation and environmental issues to your satisfaction or that of the other players. (You will have to obtain a regular Scrabble set for the game, and players follow rules prescribed in the box.) A sample beginning for a game follows.

```
  COAL
  A  I G
  R  TRASH
  SOOT S
 F I E
 ILL ROAR
 L
 T
SLEEP
C R
E
N
E
R
Y
```

Unscrambling Words

One student thinks of a transportation or environmental term and writes it down with the letters scrambled. Other students unscramble it and then define it or explain its relevance to transportation and the environment.

renyecs - scenery

oonxeimd - monoxide

ttlrei - litter

lgnu - lung

nreitghffiit - fire fighting

Unscrambling Sentences

One student thinks of a statement about transportation and the environment that he or she knows to be true or false. Another student unscrambles it and then decides whether it is true or false.

- Ears airplane loud constant may damage noise =
  Constant loud airplane noise may damage ears. (True)

- Affect auto weather pollution patterns may =
  Auto pollution may affect weather patterns (True)

- Smells from garbage environment trucks modern disease and protect the =
  Modern garbage trucks protect the environment from smells and disease. (True)

- Stop-and-go pollution may city be freeways prevent traffic auto reducing =
  City Freeways may prevent auto pollution by reducing stop-and-go traffic. (True)

Twenty Questions

A student thinks of a transportation or environmental term or concept. The other students take turns trying to guess it but are limited to twenty (or fifteen or ten) questions. If unable to guess it within that number, they lose and the originator wins. Questions are not random guesses but attempts to narrow down the topic to the words described. They can be answered only by yes or no. Wrong guessers are eliminated from the game.

Originator: OK, I've got a word--actually, it's two words.

Holly: Does it have anything to do with noise pollution?

Originator: No. That's one question.

Peter: Does it have anything to do with auto pollution?

Carol: I know! It's fuel injection!

Originator: No! You're out of that game. And that's three questions.

Wendell: Is it something cars give out from their exhaust?

Originator: Yes. Five questions.

Wendell: Wait a minute, that's only four questions, not five.

Originator: My mistake, four questions.

Wendell: Watch that.

Clark: I've got it; it's carbon dioxide!

Originator: Right you are! In six questions.

Riddles

- What has four wheels and flies?
  answer: garbage trucks
- What doesn't move but covers a lot of ground?
  answer: highways

Evaluation Method:

Games are self-evaluating.

ACTIVITY #33

Supplementary Activity — Approximate Class Time: ½-1 period

Capsule Activity Description: The class discusses the beneficial ways in which aircraft are used in relation to the environment.

Goal:

To know what beneficial uses aircraft have for the environment.

Concepts Treated:

- Transportation vehicles often have beneficial effects on the environment.
- Airplanes provide important services which help protect the environment.

ACTIVITY

Using the information provided in Chapter III in this Manual "Readings on Transportation and the Environment," discuss the ways in which airplanes are used to promote environmental protection. Begin by asking students to suggest ways in which aircraft are used to help the environment and then supplement your students' observations with the information in Chapter III.

Evaluation Method:

Students describe the uses of airplanes to benefit the environment and indicate what the environmental consequences might be if airplanes did not exist.

ACTIVITY #34

Supplementary Activity

Approximate Class Time: 2-3 periods

Capsule Activity Description: Students create collages illustrating beneficial and harmful effects transportation vehicles and facilities can have on the environment.

Goal:

To know some of the beneficial and harmful effects transportation vehicles and facilities can have on the environment.

Concept Treated:

- Transportation vehicles and facilities have both beneficial and harmful effects on the environment.

ACTIVITY

Developing collages can be a very useful exercise in a unit on transportation and the environment because:

- They require the artist to compare continuously his own feelings and ideas about transportation and the environment with those expressed in the pictures he searches through so that his final selections will exactly express his own feelings and ideas. Collages, in short, clarify ideas and feelings.

- They require an artist to organize his thoughts about transportation and the environment in order to organize his collage. This organizing reveals overlooked relationships between different facets of the field, for example, relationships between transportation vehicles and noise, or between highways and land use.

Students cut pictures or words out of magazines and newspapers or develop pictures or words of their own and paste them onto poster paper. The collages can depict one particular type of transportation effect on the environment, such as harmful effects (air pollution, energy depletion, land abuse, population shifts) or beneficial uses (fire fighting, access to natural environment areas, and pollution monitoring). Students can also depict both beneficial and harmful effects on the same collage.

When the collages are completed, divide the class into small groups and give students written instructions to

1. Pass around and examine the collages in your group and decide what effects each one illustrates. Make a list of these effects.

2. Discuss why you feel these effects are or might be harmful or beneficial.

The groups report their results to the class and respond to questions and comments.

Evaluation Method:

Students describe several of the beneficial and harmful effects transportation vehicles and facilities have on the environment and justify their evaluations.

Variations and Supplementary Activities:

Students can develop collages which illustrate ways in which features of the environment may hamper travel safety, enjoyment, and convenience.

Students can develop their collages as homework rather than in class.

ACTIVITY #35

Supplementary Activity — Approximate Class Time: 1 period

Capsule Activity Description: Students discuss what individuals can do to persuade others to reduce transportation's harmful effects on the environment.

Goal:

To know when and how to persuade other people to modify their travel habits to protect the environment.

Concepts Treated:

- Citizens need to decide for themselves when it is appropriate to urge other people to change travel practices which harm the environment.
- It is often difficult to persuade people to travel in environmentally appropriate ways.
- There are effective methods by which citizens can often persuade each other to travel in ways which protect the environment and conserve scarce energy resources.

ACTIVITY

Students write their responses to the scenario provided at the end of the activity. During the following class period, divide the students into small groups. Give them written instructions to read each other's papers, and discuss and reach agreement on

1. Which travel behaviors most individuals would be willing to try to persuade others to change.
2. Whom they would persuade--anyone? parents? children? spouses? boy/girlfriends? neighbors? friends?
3. What might make it difficult to persuade others to change their travel habits?
4. How individuals can be encouraged and motivated to persuade friends, relatives or neighbors to change their travel habits.

Groups report their conclusions to the class and respond to questions and comments from the class and you. Then raise for discussion any actions that students may have ignored, such as

- Not using the car so much for errands and combining errands into one trip
- Using public transportation to commute to work
- Driving the car at lower speeds
- Buying a smaller, economy car
- Repairing noisy mufflers
- Not littering the roadway while driving
- Not letting the car idle unnecessarily
- Keeping the car engine in good repair
- Not modifying or "souping up" vehicles
- Forming a carpool

Evaluation Method:

Students perform the following activity (#36).

INSTRUCTIONS TO STUDENTS

This is the story in which Susan has persuaded Joe to change his travel habits in some way in order to protect the environment. Think up something Susan might have been asking Joe to do or not to do about the way he travels that would help protect the environment. Write how the story began. There is no "right" answer; just think of something that makes sense and write a convincing story.

"Well," said Joe, "I'll have to admit, you have a point. Okay, I agree. But you really had some nerve asking me that."

"You don't know how nervous I was asking you, Joe!" Susan replied. "I've wanted to ask you for some time, but I was afraid you'd only get mad. But I'm glad I finally did, and you changed your mind."

Write how the story began.

ACTIVITY #36

Supplementary Activity — Approximate Class Time: 1-2 periods

Capsule Activity Description: Students discuss actions individuals can take to avoid transportation's harmful effects on the environment that affect these same individuals personally.

Goal:

To be able to identify actions people can take to avoid unpleasant transportation effects.

Concepts Treated:

- Transportation vehicles and facilities affect many people in unpleasant ways.
- Citizens have four major ways of responding to unpleasant transportation effects: putting up with them; avoiding them; having them discontinued; or aiming at a compromise.
- Citizens need to develop the ability to decide what responses they should adopt to cope with transportation's effects which disturb them personally.

ACTIVITY

Students write their responses to the scenario and instructions provided at the end of the activity. Read several anonymous responses that advocate two methods for sparing individuals the personal consequences of transportation's harmful impact on the environment: changing the behavior of the individual(s) responsible for the effect, and taking action to avoid the impact by preventing it from reaching or bothering the person affected. For example, one solution to noises from trucks on the street where one lives is to ban truck traffic from the street. This type of solution forces the party or parties responsible for the problem to eliminate it. A second solution would be for the people affected to move to another part of town. This type of solution removes the aggrieved individual from the problem. After explaining this distinction, divide students into small groups to read each other's responses.

1. List all the ways they said the homeowner could solve his or her problem by escaping or avoiding it.

2. Consider and list other solutions which involve a compromise between these two extremes.

3. Discuss what things may make it difficult for the individual(s) responsible for the problem to reach a solution or compromise.

4. Discuss which of these solutions the homeowner should adopt and why.

You can then have students discuss the three possible solutions to one or more of the remaining scenarios provided at the end of the activity--avoidance, escape, or compromise.

The groups report conclusions to the class and respond to comments and questions from the class and you.

Evaluation Method:

Students perform the activity a second time using one of the additional scenarios provided at the end of the activity.

INSTRUCTIONS TO STUDENTS

Read the following story carefully and answer the question at the end as if you were the person involved.

You live on Forest Street, a pleasant, two-lane, tree-lined street in the suburbs. However, Forest Street connects two main highways, Route 2 and Route 65. As a result, huge trailer trucks drive down the street day and night. The noise is disturbing and makes it difficult for you and your children to sleep. It's not too bad during the day when you're busy or out of the house, but at night it can be unbearable. Last night you were awake all night because of the noise; it seemed as though half of the trucks didn't have a muffler. But while tossing in your bed, you hit on a solution to the problem.

There are no right or wrong answers, just many different solutions.

ADDITIONAL SCENARIOS FOR DISCUSSION

You swim in a lake that has suddenly been invaded by motor boats that make a racket. What's your solution to the problem?

The town is going to widen the road in front of your house. There will now be more traffic moving faster which you feel could be hazardous to the children on your street. What's your solution?

You live next door to the fire station. At all hours of the day and night the engines come out with their sirens wailing, waking you up several times during some nights. What's your solution?

You live by a stop light. During the day and evening, kids like to stop their cars two abreast at the light and then "peel out" when the light changes, squealing their tires. The noise makes it difficult for you to concentrate, and you are a lawyer who does all his work at home--work that requires great concentration. What's your solution?

You live near the airport. The noise of planes taking off and landing every few minutes makes it difficult for you to carry on a conversation with your family or guests. The airport authority has just announced plans to build a parallel runway so they can handle twice as many planes. What's your solution?

You live near the airport. Planes taking off deposit soot on your house, laundry, clothing, and car. Even the air you breathe smells awful. What's your solution?

You live near the airport and the planes taking off and landing are hurting your ears. You went to a doctor who told you your ears are being damaged by the constant loud noise. What's your solution?

You work in the city, and it's not easy to get another job these days. But once or twice a month there is so much pollution in the air that your eyes water and you cough badly. You have always had a tendency to get bronchitis and you are concerned that the pollution may be damaging your lungs. What's your solution?

Scenarios in which features of the environment interfere with transportation safety, comfort, or convenience

You live near an intersection which you must cross every day going to work. In the last month you've nearly had two serious accidents there because a large oak tree in the park blocks your view of all traffic to the right. What's your solution?

You ride your bicycle to school every day past a hamburger fast-food store where there are always soda pop cans on the sidewalk and street outside, and you are forced to weave in and out to avoid them. Yesterday you ran over one trying to avoid another one, fell off your bike, and sprained your wrist. What's your solution?

You own a restaurant in the suburbs and advertise it in the local newspapers. However, many people get lost trying to find it because of two confusing highway signs. What's your solution?

ACTIVITY #37

Supplementary Activity

Approximate Class Time: ½-1 period

Capsule Activity Description: Students evaluate the course.

ACTIVITY

Students write responses to questions designed to reveal to them and to you whether the course objectives were achieved and, if they were not, how they can be achieved in the future. Sample questions appear on the following page.

After answering questions, students can discuss in small groups or as a class the value of the course and how to improve it based on their written responses.

COURSE EVALUATION QUESTIONS FOR STUDENTS

1. What did you gain from this course? Check as many or few of the following as apply:

_____ Only a review of well-known facts

_____ A few new useful facts

_____ Much new useful information

_____ Better understanding of (Fill in what course covered.)

_____ Desire to go more deeply into study of (Fill in topics covered.)

_____ Some new and important attitudes toward (Fill in topics covered.)

_____ Changes in my personal travel behavior or my reactions to other people's travel behavior

_____ Other (explain briefly)

2. Which part of the study do you feel you learned well from?

_____ Preparation of homework assignments

_____ Individual reading

_____ Oral reports

_____ Written reports

_____ Lectures

_____ Role plays

_____ Games

_____ Individual projects

_____ Guest speakers

_____ Debates

_____ Small group discussions

_____ Class discussions

_____ Field trips

_____ Audiovisual aids

_____ Other activities (list them)

3. What is your opinion concerning the amount of time spent in this study?

_____ Too much _____ Too little _____ About right

4. Which audiovisual aids were of most value?

5. From which books and pamphlets did you learn the most?

6. From which games did you learn the most?

7. From which role plays did you learn the most?

8. What questions or topics had you hoped would be included in the study but were not?

9. What suggestions do you have for improving the course?

10. Do you feel that there was unnecessary repetition in material covered in this class and material covered in another class or classes? If so, what material?

11. What do you think are the greatest needs in transportation and environmental education?

12. After having considered very carefully what you have learned during this course, have you changed your mind concerning your personal use of transportation vehicles and facilities? If so, how?

13. After having considered what you have learned, do you plan in the future, when you have a driver's license, to travel any differently than you planned before the course?

14. Have you developed any interest in taking part in citizen participation activities to resolve conflicts between transportation and the environment?

ACTIVITY #38

Supplementary Activity

Approximate Class Time: ¼-½ period

Capsule Activity Description: You and your students evaluate student attitudes toward issues related to transportation and the environment.

ACTIVITY

Students answer questions designed to indicate their attitudes toward issues related to transportation and the environment. Sample questions (from which you can select those you find useful) are provided on the following pages.

By having students answer the questions before and after your course, you can learn whether what they studied changed their attitudes. Or you can administer the questions before the course just to determine what direction you feel your unit should take--which student attitudes need addressing most.

The questions should be answered anonymously to allow students to feel free to express their feelings.

Answers may reflect a variety of factors, including ignorance, indifference, reasoned thought, traumatic personal experiences, and parroting the acceptable answer.

Check the appropriate column that indicates most accurately your feelings about the question.

Questions	*Agree Strongly*	*Agree*	*No Opinion*	*Disagree*	*Disagree Strongly*
1. Generally speaking, transportation has no seriously harmful effects on the environment.					
2. Only automobiles have important transportation effects on the environment.					
3. Nobody really knows how much automobiles, planes, etc. damage the environment.					
4. Transportation has very little to do with the energy shortage in this country.					
5. Transportation (cars, planes, etc.) has a lot to do with how our land gets used.					
6. Noises made by planes, cars, etc. seriously disturb a lot of people.					
7. Highways enable the public to take advantage of the beauty of the natural environment.					
8. Airplanes can protect as well as harm the environment.					
9. Features of the environment never interfere with travel safety or enjoyment.					

Questions	Agree Strongly	Agree	No Opinion	Disagree	Disagree Strongly
10. Nothing that individual citizens can do in their private lives will help reduce the harmful effects cars, planes, etc. have on the environment.					
11. There are some things I could personally do that would help reduce the harmful effects cars, planes, etc. have on the environment.					
12. The government has no right to ask us to change our daily routine to help reduce the effects cars or planes have on the environment.					
13. Most Americans are too attached to their cars to agree of their own free will to use them less or use them more efficiently.					
14. If citizens knew more about how their use of cars or planes damages the environment, they would not use them so much.					
15. If a private citizen is personally bothered by a neighbor's or friend's use of a car or snowmobile, he or she should consider trying to get that person to stop doing it or work with the person to find a compromise.					

Questions	Agree Strongly	Agree	No Opinion	Disagree	Disagree Strongly
16. If a private citizen is annoyed that a friend or neighbor is doing something with his car or snowmobile that harms the environment, even though it doesn't bother him or her *personally*, he or she should consider trying to get that person to stop doing it or work with the person to find a compromise.					
17. There's nothing that private citizens can do to persuade other private citizens, like neighbors, friends, family members, and fellow workers to take actions that will reduce the harmful effects of cars, planes, etc. on the environment.					
18. There are times when we should consider objecting to other citizens' actions regarding the environment which interfere with travel safety or convenience.					
19. Whenever there is a choice between protecting the environment or getting more fuel, we should protect the environment.					
20. There's nothing we, as ordinary citizens, can do in the way of political action to reduce the harmful effects cars, planes, etc. have on the environment.					

Questions	Agree Strongly	Agree	No Opinion	Disagree	Disagree Strongly
21. Citizens should never engage in activist methods to reduce the harmful effects of cars, planes, etc. on the environment--methods like boycotts, pickets, or public demonstrations.					
22. Citizen participation in transportation planning is encouraged by the federal government.					
23. If people knew more about how to take part in social or political actions to reduce the harmful effects cars, planes, etc. have on the environment, they would engage in such activities.					
24. If people had more courage, they would get more involved in social and political action to prevent transportation from damaging the environment.					
25. There are just too many obstacles for ordinary citizens to get involved with political or social action to reduce the harmful effects cars, planes, etc. have on the environment.					

Questions	Agree Strongly	Agree	No Opinion	Disagree	Disagree Strongly
26. It is useful to write letters to politicans and other officials protesting or supporting their policies on transportation.					
27. Citizens should consider what benefits transportation provides society before taking action to reduce its harmful effects on the environment.					

ACTIVITY #39

Supplementary Activity

Approximate Class Time: ½-1 period

Capsule Activity Description: Students respond to written or oral questions about issues related to transportation and the environment.

ACTIVITY

Students answer written or oral questions abut issues related to transportation and the environment. Sample questions (you can select those which are useful) are provided on the following pages. The questions are divided into three topic areas:

1. The effects of transportation on the environment and ways in which features of the environment may interfere with travel safety, convenience, or enjoyment.

2. Personal travel alternatives which will help reduce transportation's harmful effects on the environment.

3. Citizen participation to reduce transportation's harmful effects on the environment.

Sample questions on transportation's environmental effects. The correct answers to true-false and multiple-choice questions are in italics. Use those questions which relate to activities your students have studied.

Essay Questions

1. How do cars (airplanes, trucks) cause pollution?

2. Name several things we travel in that use up energy.

3. What causes pollution?

4. How can pollution affect people's health?

5. Can noises be harmful? How? Why?

6. Do any vehicles make loud noises that might be harmful? Which ones? What noises do they make? Do any make pleasant noises?

7. Things like billboards are built to help take care of cars. Do these or other things built for cars cause pollution? How much land do they use up?

8. Sometimes we have to look at things that are ugly or unpleasant. Can you think of any ugly sights that exist because of cars, trucks, or airplanes? Can you think of any pleasant sights that exist because of cars, trucks, or airplanes?

9. How are airplanes and trucks used to benefit the environment?

10. If someone lived near a small airport in the middle of a farming state and objected to airplane noise, what advantages and disadvantages to the environment from use of airplanes should the person consider before deciding to favor or oppose the airport?

11. If someone is buying a new car, what kind of car should he or she think about buying if he or she doesn't want the new car to cause pollution or use up too much energy?

12. Do cars, trucks, buses, trains, or airplanes make any noises that bother you? Why do these noises bother you?

13. How do people get to work and home? Which of these methods use up the most energy and cause the most pollution?

14. How do highways help us to enjoy scenery?

15. Give three examples of actions taken by the Federal government to protect the environment from harmful effects of transportation.

16. Give one example of how the Federal government provides for citizen participation in transportation planning.

17. In what ways can features of the environment create obstacles to travel safety, convenience, or enjoyment?

True-false Questions

1.	Cars are the only means of travel that cause pollution	True	*False*
2.	Airplanes don't cause any pollution.	True	*False*
3.	Loud noises aren't really a form of pollution.	True	*False*

4.	A lot of things are built to take care of cars. These things take up a lot of land in the community.	*True*	False
5.	Airplanes are used in many ways to solve environmental problems.	*True*	False
6.	Most people get to work and home by car.	*True*	False
7.	Cars are using up a lot of our energy--gasoline, for example	*True*	False
8.	Fun vehicles like snowmobiles and motorcycles cause pollution.	*True*	False
9.	Automobile pollution is unpleasant, but it doesn't really hurt anyone seriously.	True	*False*
10.	Loud noises are awful to hear but they aren't dangerous.	True	*False*
11.	Cars and trucks do nothing good for the environment.	True	*False*
12.	Some people have trouble sleeping or hearing television because of loud noises from airplanes or cars.	*True*	False
13.	Airplanes leave dirt on the houses and clothing near airports.	*True*	False
14.	Because of cars, we sometimes see ugly scenes like automobile junkyards and litter.	*True*	False
15.	Without cars and boats, we would have more difficulty seeing pretty scenery.	*True*	False
16.	We can see all the air pollution that's really serious.	True	*False*
17.	Without highways people couldn't go hiking and camping as easily.	*True*	False
18.	Features of the environment sometimes interfere with travel safety.	*True*	False

Multiple-choice Questions (Answers reflect 1974 data)

1. Transportation's harmful effects on the environment include all of the following except

   (a) *Garbage collection*
   (b) Population movement
   (c) Air and noise pollution
   (d) Land use
   (e) Energy consumption

2. Noise pollution from cars, planes, and trucks directly relates to all of the following except

   (a) *Automobile insurance*
   (b) Transportation planning
   (c) Recreational vehicles
   (d) Urban transportation problems

3. The average commuter in the United States spends how many minutes or hours a working day traveling to *and* from work?

   (a) 5 minutes
   (b) *20 minutes*
   (c) 1 hour
   (d) 3 hours
   (e) 5 hours

4. What percentage of the land in the average city is used up by roads and highways?

   (a) 1 percent
   (b) 15 percent
   (c) *35 percent*
   (d) 75 percent

5. What percentage of the land in the average city is used up by businesses which service automobiles?

   (a) 1 percent
   (b) 15 percent
   (c) *35 percent*
   (d) 75 percent

6. Most people think of car exhausts when they think of automobile pollution. Which of the following automobile parts also affect the environment?

   (a) Fan belts
   (b) Brakes
   (c) Tires
   (d) All of the above
   (e) (a) and (b)
   (f) *(b) and (c)*

7. Ground brake linings and clutch facings in cars pollute the air with a potentially dangerous substance called

   (a) Carbon monoxide
   (b) *Asbestos*
   (c) Kryptonite
   (d) Sulphuric acid

8. Many recreational vehicles, especially boats, trailbikes and snowmobiles, can affect the environment because they

   (a) Consume gasoline
   (b) Cause population shifts
   (c) Create unattractive vistas
   (d) Make loud noises which bother animals and people
   (e) (a), (b), and (d)
   (f) (a) and (b)
   (g) *(a) and (d)*

9. How much air pollution in the average city was caused by automobiles as of 1974?

   (a) 5 percent
   (b) 30 percent
   (c) *60 percent*
   (d) 85 percent

10. Automobile pollution in the air is proven or suspected as causing all of the following except

    (a) *Pneumonia*
    (b) Emphysema
    (c) Cancer
    (d) Birth defects
    (e) Bronchitis

11. Automobile exhaust can have bad effects on all of the following except

    (a) Clothing
    (b) Livestock
    (c) Monuments and public hearings
    (d) Plants
    (e) *Telephone poles*

12. Besides being annoying, noise pollution from cars and planes can affect all of the following except

    (a) Hearing
    (b) Sleep
    (c) Concentration
    (d) *Sight*

13. Transportation's beneficial effects on the environment

    (a) Are nonexistent
    (b) *Must be weighed against its harmful effects in deciding what action to take*
    (c) Always outweigh its harmful effects
    (d) Benefit only automobile drivers

14. Airplanes provide all the following beneficial effects on the environment except

    (a) Fighting forest fires
    (b) *Cleaning livestock*
    (c) Spraying and killing unwanted insects
    (d) Help to control the weather

15. Highways benefit the environment in all of the following ways except

    (a) Enabling people to view scenery
    (b) Reducing stop-and-go traffic
    (c) Enabling people to hike and camp out
    (d) *Preventing the land from eroding*

Sample questions on personal travel alternatives.

Essay Questions

1. If your older brother or sister was driving a car without a muffler and was making a racket, would you tell him or her to get the muffler fixed? Why or why not?

2. If your father or mother drove to work every day when they could easily take the bus or subway and save gasoline, would you tell him or her to take the bus? Why or why not?

3. If you owned a car and drove to work every day, would you consider taking the bus or subway instead? What if you had to walk five blocks to get the bus? Why or why not?

4. Why do some people not like to take the bus or subway? Do you think these are good reasons?

5. Cars cause a lot of pollution. What things could people do that would limit pollution caused by cars?

6. What are carpools? How could they help the pollution problem? How could they help the energy problem?

7. How could people save gasoline in their everyday driving behavior?

8. Why do people use their cars so much? Do you think these are good reasons for using cars? Why or why not?

True-False Questions

1.	Some people have to decide whether to put up with loud noises and air pollution or move to another home.	*True*	False
2.	There's nothing people can do about air pollution caused by cars.	True	*False*
3.	One way people could help save gasoline is to keep their cars in good running condition.	*True*	False
4.	One way people could save gasoline is to drive more slowly.	*True*	False
5.	Some people won't give up using their cars or use them more efficiently because they're selfish.	*True*	False
6.	"Carpools" means that people who work in the same building together all park in the same parking lot.	True	*False*
7.	Carpools are formed when several people who work in the same building ride to work together in one car.	True	False
8.	Litter can be dangerous for driving safety.	*True*	False
9.	Trees and bushes never cause accidents.	True	*False*

Sample questions on citizen participation in which citizens can become involved to reduce transportation's harmful effects on the environment and the interference some features of the environment cause travel safety, convenience, or enjoyment.

Essay Questions

1. What things could people do if they joined together to reduce pollution caused by cars and airplanes, and alter or eliminate features of the environment which interfere with travel?

2. Are there actions young people could take as a group that would help reduce pollution caused by cars, airplanes, etc., and alter features of the environment that interfere with travel? What could they do?

3. If you want to write letters to powerful people who might be able to reduce pollution caused by cars, airplanes, etc., or eliminate a feature of the environment which was interfering with travel safety, convenience, or enjoyment, whom would you write to? Why to them?

4. Are there any actions businesses could take that would reduce pollution caused by cars, airplanes, etc.?

5. Who do you think should educate the people about how cars, airplanes, etc. pollute? Why these people?

6. Why are automobiles that cause pollution still built?

7. It is easy or difficult for citizens to get together to do something about pollution from cars, planes, etc.? Why? What makes it easy or difficult?

8. If people wanted to get together and start a campaign to educate the public about what they can do about pollution from cars, planes, etc., and about features of the environment that interfere with travel, how could they start such a campaign?

9. What things sometimes make it difficult to reduce the harmful effects cars, planes, etc. can cause to the environment.

10. What are the most important benefits transportation provides society?

True-false Questions

1.	Everyone already knows how cars and airplanes cause pollution.	True	*False*
2.	The only reason people don't make cars that don't pollute is that we don't know how to do it.	True	*False*
3.	Cars that don't pollute generally don't work quite as efficiently as other cars.	*True*	False
4.	Some people don't get together to do something about car or plane pollution because they think common action won't do any good.	*True*	False

5.	Companies can sometimes do things or make suggestions to their workers that might help reduce car or plane pollution.	*True*	False
6.	Before trying to do something about car or plane pollution, people should try to decide whether what they want to do will hurt other people.	*True*	False
7.	Before taking action to reduce pollution caused by cars, planes, etc., people should consider first what good things cars and planes do for society.	*True*	False
8.	Before taking action to reduce pollution caused by cars and planes people should consider first what good things cars and planes do for society.	*True*	False

READINGS ON TRANSPORTATION AND THE ENVIRONMENT

ENVIRONMENTAL AND HEALTH EFFECTS OF AIR POLLUTION*

The effects of air pollution vary with time and place and person, but few of us can escape these effects altogether. Air pollution can impair health. Dirty air makes eyes water and smart; it stings the throat and upsets breathing. People with chronic lung or heart disease are particularly vulnerable to air pollution. Epidemiological studies indicate that direct relationships exist between prolonged exposure to polluted air and the incidence of emphysema, bronchitis, asthma and lung cancer. Polluted air, sustained and heavy for several days, has caused serious illness and death--especially among infants, the elderly, and people with weakened hearts or lungs.

More obviously, air pollution reduces visibility. It can spoil scenic vistas. It can ground planes and make driving hazardous. Its corrosive qualities cause vast economic losses and contribute to the deterioration of cities. It rots and soils clothes, discolors house paints, and rusts metals. It marks monuments and public buildings and increases housekeeping chores and costs for families and businesses.

Damage from air pollution affects rural areas too. It injures vegetation, stunts the growth of shrubs and flowers, damages crops and trees and causes illness among livestock. To farmers, these costs are direct; to most of us, they come indirectly in the form of higher food bills.

Air pollution threatens the delicate, complex natural systems on which all life depends. Undesirable ecological changes may well be its most dangerous long-range result. Signs of climatic alternations are already appearing, at least on a small scale. In 1969 we poured 281 million tons of pollutants into the air in the United States alone, ignoring the dangers that we might be degrading our environment beyond repair.

Automobile Emissions and Their Control

The automobile is one of the nation's major environmental polluters. By weight, more than half of all of the nation's man-made air pollution can be attributed to the internal combustion engine. In some urban areas, it reaches 85 percent of the total quantity of air pollution. Its exhausts include carbon monoxide, hydrocarbons and nitrogen oxides. The automobile also emits varying amounts of lead abestos and other pollutants, many of which end up in the lungs.

Efforts to reduce the level of auto emissions in this country are proceeding along three fronts. Individuals are being encouraged by public interest organizations to increase their use of less polluting modes of travel--car pools, bicycles, walking, and public transportation--and to maintain their automobiles in optimum emission-reducing condition. At the same time, Congress recognized, in passing the 1970 Clean Air Amendments, that the real problem rests with the internal combustion engine itself. Finally, the various states having major air pollution problems have undertaken a program of controlling emissions from already existing vehicles.

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*This reading has been adapted from *A Citizen's Guide to Clean Air*, the Conservation Foundation, 1717 Massachusetts Ave., N.W., Washington, D.C. 20036 under contract with the U.S. Environmental Protection Agency, Catalog No. 71-187901, January 1972.

The 1970 Clean Air Amendments

This law requires that the Federal Environmental Protection Agency (EPA) set standards for emission of carbon monoxide, hydrocarbons and nitrogen oxides. On June 30, 1971, EPA announced a staged schedule for emission reduction which would ultimately result in the following maximum levels of the three major pollutants:

3.4 grams of carbon monoxide per vehicle mile (1975)

.41 grams of hydrocarbons per vehicle mile (1975)

.40 grams of nitrogen oxides per vehicle mile (1976)

The burden of achieving these standards rests with the automobile manufacturers who may request extensions in the timetable but must ultimately comply with this legislation.

Assuming that the automobile manufacturers do eventually meet standards, how reliable will the emission control devices be? The earlier devices have not proved to be entirely satisfactory. The *Washington Post* reported on August 29, 1971, that

> a seven-city survey of 1,000 privately driven 1970 models, averaging 9,000 miles use, found them exceeding their carbon monoxide ceilings by 100% and their hydrocarbons by 50%. EPA scientists do not know why these 1970s showed such poor results, but theorize that ignition and stalling problems prompted owners to take their cars in for adjustments that distorted the performance of emission controls, which rely on a retarded spark and a clean fuel-air mixture.

The 1970 Clean Air Amendments authorize the agency to test assembly-line models and require the manufacturers to do so also. The Act prohibits manufacturers or dealers from selling noncomplying vehicles and from removing or making inoperable any control device. Penalties for violation of this section are as high as $10,000 for each offense. EPA is required to publish the results of emission tests performed on prototype and assembly-line models of all makes of new cars. Citizens can consult the regional EPA offices to find out when the results are published in the *Federal Register*.

Beginning with 1971 model cars, manufacturers have been required to include in their new car warranties a guarantee that the car complies with applicable emission regulations and that it is free from any defects that would prevent it from complying during its useful life (five years or 50,000 miles). When better tests have been developed to check the performance of the emission control devices, the manufacturers must provide new warranties which require that they replace at their own expense any faulty control device if, during the car's useful life

1. The faulty device was maintained and operated in accordance with the manufacturer's instructions;

2. Failure of the device results in the owner being penalized, including the loss or right to operate the car, fines, and so on.

The law also provides a Federal program for the purchase of special low-emission vehicles for government use, once they are developed. Citizens may decide to urge their state and municipal governments to adopt similar purchase requirements. Once the Federal certification and purchasing program has stimulated the development of such vehicles, state purchases can help expand the market. The city of Boston has already announced its plan to convert all city-owned cars to run on liquified natural gas. Since the costs of fuel and maintenance for this fuel are lower than those for ordinary cars, Boston hopes to recover much of its initial changeover investment while reducing air pollution in the city.

State Responsibilities for Auto Emission Control

Although the 1970 Clean Air Amendments specifically prohibit states (except California) from setting their own emission standards for *new* vehicles they do retain the responsibility of controlling emissions for *existing* vehicles. This poses a number of problems, such as establishing vehicle inspection and enforcement programs, developing other control strategies and ensuring the availability of alternative modes of transportation.

Auto emission standards are only as good as their enforcement, and enforcement may be almost impossible without a practical, reliable inspection system. Many states are contemplating adding an emission inspection to their automobile safety inspection, but several factors should be considered before such a decision is advocated by citizen groups. One of these is the lack of simple and reliable testing equipment and procedures which produce replicable results. Several practical and reportedly accurate testing systems are under development, but they may prove expensive. Expense itself is another factor. Will the benefits of an inspection program outweigh the cost of establishing and maintaining it? The initial investment for a statewide system can easily run into millions of dollars, and the results of a few experimental programs have been disappointing. It is often difficult to get proper repairs for cars that have failed the test. Once the control device is adjusted, it may only remain that way for a couple of months. Emission control devices do curtail vehicle performance, especially in acceleration and idling. Thus, a third problem is the tendency of many motorists to adjust their cars properly only to pass the test, and then readjust them to operate more satisfactorily.

Another problem to be considered is the operational difficulties of administering a state-wide inspection program in states having varying amounts of air pollution, depending on the distribution of population, the distances between urban centers and meteorological conditions. Sparsely populated states may find the costs of operating such a system prohibitive. Finally, the heaviest burden of a vehicle inspection system may well fall on low-income car owners who often drive the older and less-cared-for problem cars and generally have poor access to public transportation to much needed jobs, schools and shopping.

There are alternatives to vehicle inspection systems which show promise for effective reduction of air pollution. These methods focus on reducing the total number of miles driven by all cars in a heavily polluted

area, instead of on the emissions of an individual vehicle. These control strategies include reduction of highway construction, restriction on driving in certain downtown areas, incentives to car poolers, taxes on mileage or on gasoline, express busways along existing freeways, and the development and support of high quality public transportation in urban areas. They are generally part of a state's "implementation plan"--that plan required under the 1970 Clean Air Amendments for the "implementation, maintenance and enforcement" of any air quality standard set forth by EPA.

Before advocating either an emission inspection program or alternative control strategies, citizens may want to do further research on the advantages and problems of each. One place to start is with two studies done for EPA by the Institute of Public Administration. These are Governmental Approaches to Air Pollution Control and Governmental Approaches to Automobile Air Pollution Control. Both studies present interesting discussions of the economic and administrative dimensions of different control strategies.

The Citizen's Role

In addition to curtailing the pollution from their own vehicles, citizens have several other responsibilities with respect to controlling automobile pollution. The first of these is being informed. The 1970 Clean Air Amendments recognize the right of citizens to know what the air quality situation is in their respective regions. States are thus required to gather emission data from individual sources, correlate them with the standards, and make this information available to the public. Citizens in some states may want to press their state agencies to make such reports available in local libraries or other accessible locations.

Even more important is attendance at and participation in public hearings. The Clean Air Amendments of 1970 declare that public hearings must be held in each state before it adopts an implementation plan and sends it to EPA for approval. Each state must

1. Provide at least 30 days' notice of a hearing through prominent advertisement of the hearing's date, time and place;

2. Make available for public inspection, in at least one location in each control region, the principal portions of the proposed implementation plan for that region;

3. Make available for inspection all rules and regulations proposed for inclusion in the plan; and

4. Keep hearing records that will contain, at a minimum, the list of those testifying, together with the text of each presentation.

Citizens may want to press state officials to hold a public hearing in their locale, even though technically only one is required in the state. Attendance of large numbers of people at hearings who support strong plans and testify to this effect, however briefly, will help counter the arguments of those who claim that environmental concern is a passing fancy. This testimony will help to build a good hearing record which is important in EPA's consideration of whether or not to approve the plan. Also, if there are any legal challenges to the plan, the court will base its decision, in part, on the hearing record.

Finally, the 1970 Amendments specifically recognize the right of citizens to bring suit against any violator of standards or other requirements of the Act. Any "person" may sue another "person" for failure to enforce or comply as required. "Person" is defined as "an individual, corporation, partnership, association, State, municipality, or political subdivision of a State." There are two limitations to this right: no one may sue EPA for an action not specifically required under the Act, and no one may sue his own state, except under certain circumstances. The Act authorizes any court to award any costs of litigation, including expert witness fees and reasonable attorney fees, to any party to a suit, as the court thinks appropriate. Although this provision removes one of the common deterrents to litigation by private citizens--expense--court action can still be very difficult and time consuming, and may not always be the most effective way to proceed. A good attorney should be consulted on the desirability of taking this kind of action.

Environmental Statements Required for Highway Projects

An FHWA Policy and Procedure Memorandum, PPM 90-1, gives guidelines for environmental statements that are now required by Federal legislation.

Section 102(2) (c) of the National Environmental Policy Act of 1969 requires statements on environmental impact to the Council on Environmental Quality. Section 4(f) of the Department of Transportation Act sets conditions on the use of certain public land. Section 470f of 16 U.S. Code requires consideration of effect on historic sites. Section 309 of the Clean Air Act of 1970 restricts Federal projects that have environmental impact on matters in the Act.

As the PPM states, it is a national policy that all Federal agencies promote efforts for improving the relationship between man and his environment and to make special efforts for preserving the natural beauty of the countryside and public park and recreational lands, wildlife and waterfowl refuges, and historial sites.

It is also national policy that Federal agencies consult with other appropriate Federal, state, and local agencies; assess in detail the potential environmental impact in order that adverse effects be avoided and environmental quality is restored or enhanced, to the fullest extent practicable; and utilize a systematic, interdisciplinary approach which will insure that integrated use of the natural and social sciences and the environmental design arts in planning and decision making which may have an impact on man's environment. The environmental assessments include the broad range of both beneficial and detrimental effects.

An environmental statement for a highway project must include the following information: (1) A description of the proposed highway improvement and its surroundings. (2) The probable impact of the proposed development or improvement. (3) Any probable adverse environmental effects which cannot be avoided should the proposal be implemented. (4) Alternative locations or designs with complete descriptions. (5) The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity. (6) Any irreversible and irretrievable commitments of resources which would be involved in the proposed action

should be implemented. (7) Where unavoidable adverse environmental effects are encountered, planning measures taken and proposed to minimize harm to be identified, including those relating to Section 4(f) lands. (8) Final statements to incorporate all comments received on the draft (including environmental comments contained in the public hearing transcript) along with a discussion of the comments and suggestions.

A proposal to develop or improve a highway section should be coordinated in the early stages with appropriate local, state, and Federal agencies under regular FHWA procedures. Coordination at the beginning of the location study will assist in identifying natural and cultural areas of significance, agency and public concerns, and help in determining the need for and preparation of an environmental statement.

Draft environmental statements must be furnished to the Council on Environmental Quality (10 copies), the Department of Transportation's Office of Environment and Urban Systems (3), the FHWA Office of Environmental Policy (2), and the FHWA Regional Office (1). Thirty to 45 days must be allowed for comments. The statements must be available for review by the public and at the appropriate public hearings. They will also be made available for purchase from the National Technical Information Service.

The final environmental statement shall include a copy of all comments received and reflect the consideration and disposition of the environmental comments at the public hearing and the comments received on the draft statement. Negative declarations shall be prepared when the anticipated impact of construction and operation of a highway section is determined to be not of major importance.

Environmental statements must be prepared for all highway sections financed with Federal funds which received design approval after February 1, 1971. For such highway sections that received design approval between January 1, 1970, and February 1, 1971, statements must be prepared if the FHWA Division Engineer judges it to be necessary for full implementation of the National Environmental Policy Act.

In addition, the National Environmental Policy Act also applies to new airports and several other major projects that would significantly affect the environment. The Act is designed to encourage environmental considerations at the earliest levels of decision-making for all of these areas in an attempt to harmonize transportation planning and programs with the surrounding environment.

Process Guidelines for the Action Plan

The work of the highway official has shifted dramatically in recent years. In the early days, highway funds were largely spent on improvements to existing substandard roads. Today, highway projects often go where there never has been a road, and find it increasingly difficult to avoid encountering housing development, scenic view, or park. Not too long ago, measures to soften the environmental impact of highways were often seen by the public as extravagant frills. Now the public pressures for funds to be spent in this direction. The highway official, state and local, has

long been aware of the potential impact of his work. To build a road, one must fell the tree, lower the hill, bridge the river. Highway experts have sought to soften these impacts--experimenting with planning techniques and improving construction methods.

In response to public demand, Congress has enacted a series of requirements and authorizations to help the highway administrator protect the environment:

- The 1950 Federal-aid Highway Act created public hearing requirements.
- In 1962, legislation called for greater participation by local officials, and coordination of urban transportation plans with an area's comprehensive plan.
- In 1966, Section 4(f) of the Department of Transportation Act called for special efforts to avoid taking land from parks, wildlife refuges, and historic sites.
- The landmark National Environmental Policy Act of 1969 required that a written evaluation of the environmental impacts of each significant project be circulated to other agencies and the public; that project development include a multi-disciplinary approach; and that alternate plans be developed.
- The Federal-aid Highway Act of 1970 contained Section 136(b), designed to make sure that each state would fully consider the impacts of any and all proposals for highways within that state.

Section 136(b) called on the Secretary of Transportation to assist states to reach this goal by issuing guidelines--general directions to the states for incorporating, in highway decisions, factors of economic, social and environmental significance.

Federal highway authorities felt that a *process* approach would be most practical to the guidelines. The *process* approach requires each state to detail the process or procedures that it will follow to make certain it will give proper consideration to the effects of its highway works. This detailing of a state's individual procedure is called its *action plan*. The *process* approach and its required plans recognize that the definition of environment can often best be made by a community itself and provide means of doing this through involvement of the public and other agencies.

Specifically, the guidelines spell out four fundamentals that an action plan must satisfy, each fundamental to be developed by a state and used in its highway programs. The guidelines only point the way.

The first fundamental is *identification*. A state highway department must build a competency in identifying and objectively studying the impacts of a highway project--economic, social, environmental. It must have the experts on its staff, or available as outside experts or consultants, who can make professional, in-depth studies. Although other

agencies can assist in these studies, the state must have a competent, qualified source of expertise. Without this competence, a state highway agency would have difficulty convincing the public that its decisions are based on a knowledgeable balancing of transportation, economic, social, and environmental issues.

The second fundamental is the requirement that a state highway authority develop an *interdisciplinary* approach to highway projects... from early systems planning to final design...since not all the impacts and problems involved in a highway plan are exclusively of an engineering nature. The action plan must show how a state will have the expertise of other disciplines to assist the state's investigation into a project's various by-products, especially those of a non-transportation nature.

The third fundamental is *involvement*. Other agencies, and the public, must be involved in the planning, location, and design of a highway, in a manner each action plan spells out.

Only by such involvement can impacts be forced to surface that highway specialists--unassisted--might not recognize. Only by such involvement can public attitudes toward a specific project be determined as a vital ingredient in the making of decisions in the public interest. Only by such involvement can public confidence in a state highway agency's knowledge and fairness be maintained.

The fourth fundamental is *alternatives*. Every highway study must contain alternatives, or choices. This requirement guarantees that a highway agency will actually consider possible alternatives, and evaluate the pros and cons of each.

This requirement assures the public a chance to judge the options, rather than being presented with a single solution, and being asked to give it a yes or no. This requirement allows an agency and its public to compare the costs and benefits of taking a particular action versus a decision of no build.

Citizens may want to obtain a copy of their state action plan for review in light of these four process requirements. The specifics of the processes the states will outline in their action plan are of their choosing. Standardization of action plans is not required, or desired. The guidelines are general enough to allow each state to adopt procedures to suit its own unique situation. Thus, although each state must, for example, provide for public debate, how this is done is left to each state.

Hopefully, there will be originality and inventiveness in the way the various states elect to meet the obligations set down by the guidelines.

The development of these action plans will be a major undertaking for every state. It will, in many cases, entail significant changes in highway agency organization and procedures, the acquiring of new expertise, and the development of new areas of responsibility within highway agencies.

It offers the opportunity to bring about a solution to many of the problems that began that day long ago when the first horse trail was broadened that a car might pass.

Above all, the action plan may prove to be the answer to that dilemma of the highway administrator and engineer in our time--the need of the nation for roads, and the desire of the nation for an environment that is safe, quiet, and beautiful.

PUBLIC HEARINGS IN HIGHWAY PLANNING*

The federal Department of Transportation provides for a two hearing procedure to give all interested persons an opportunity to become fully acquainted with highway proposals that concern them and to express their views at a time in the process when the plans are still flexible. The first hearing, called a "corridor public hearing," is held before the route location is approved and before the state highway department is committed to a specific plan. The second hearing, called the "highway design public hearing," is held after the route location has been approved, but before the state highway department is committed to a specific design proposal. Both of these hearings are intended to give citizens the opportunity to present their views on the need for the road, its location, design, and social, economic and environmental effects. Other informal public meetings or additional public hearings are encouraged whenever they serve the public interest.

Both a corridor and a design hearing must be held for every Federal-aid highway project that is in a new location, or would have a different social, economic or environmental effect or would change the layout or function of connection roads or streets. Hearings are not required for such improvements as resurfacing, widening existing lanes, adding lanes, installing traffic lights or similar improvements.

A public hearing is to be well advertised in advance. Notices of the hearing must be published at least twice in a newspaper prior to the hearing date. Relevant public officials and private citizen groups are also to be notified. The hearings are to be held at a place and time that is convenient for the people affected by the highway.

At the hearing itself, the state highway department is to make available a map or other drawing which shows the area being considered. The various proposals will be presented by a representative of the state highway department, comments will be offered by elected and appointed officials, and statements or questions will be solicited from the participants. A complete transcript of the proceedings of public hearings must be prepared by the highway department for submission to the Federal Department of Transportation and retention in their files.

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*This reading is excerpted from U.S. Department of Transportation, Federal Highway Administration Policy and Procedure Memorandum 20-8, January 14, 1969, "Public Hearings and Location Approval."

PERTINENT LAWS AND REGULATIONS CONCERNING TRANSPORTATION PLANNING*

Following is a partial listing of the principal Federal-level laws, regulations, and directives which cover various aspects of the transportation planning and environmental assessment process with emphasis on the Federal-aid highway program.

1. *National Environmental Policy Act of 1969,* Public Law 91-190 (42 United States Code 4321-4347).

2. *Highways, Title 23* of the United States Code. Title 23 contains most of the Federal legislation that is directly applicable to the Federal-aid highway program. Among the most important provisions are the following:

   Section 109(h)--consideration of possible adverse social, economic and environmental effects

   Section 109(i)--development of highway noise standards

   Section 109(j)--consistency with air quality plans

   Section 128--public hearings

   Section 132--preservation of parklands

   Section 134--cooperative comprehensive planning

   Section 142--public transportation coordination

3. *Department of Transportation Act of 1966,* Public Law 89-670 (49 United States Code 1651-1659). This Act established the U.S. Department of Transportation. Section 2 contains a statement of purpose and outlines several aspects of the nation's transportation policy. Section 4(f) provides special protection for public parklands, recreation areas, wildlife and waterfowl refuges, and historic areas.

4. *Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970,* Public Law 91-646. Establishes standards and procedures governing all property acquisition and relocation programs undertaken in conjunction with Federal or Federally-assisted programs, including highways.

5. *National Historic Preservation Act of 1966,* Public Law 89-754 (16 United States Code 470). Expanded the National Register of Historic Places and created the Advisory Council on Historic Preservation.

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*Excerpted from "Getting Involved in Transportation," U.S. Department of Transportation, Office of Environment, Safety, and Consumer Affairs, 1976.

Section 106 of the Act creates a special review for all Federal projects which affect properties on the National Register.

6. *Executive Order 11514, Protection and Enhancement of Environmental Quality,* March 6, 1970. Provides additional guidance to all Federal agencies in carrying out their responsibilities under NEPA.

7. *Executive Order 11593, Protection and Enhancement of the Cultural Environment,* May 13, 1971. Expands the coverage of the National Historic Preservation Act (see Item 5, above) to include properties eligible for inclusion on the National Register as well as those which have been formally recognized.

8. Council on Environmental Quality, *Guidelines for Preparation of Environmental Impact Statements,* 40 Code of Federal Regulations Part 1500, August 1, 1973. Provides detailed guidance to all Federal agencies responsible for implementing the policies and procedures established by NEPA.

9. *Archeological and Historic Preservation Act of 1974* (May 24, 1974), Public Law 93-291. Expands the application of the 1960 Act providing for the preservation of historical and archeological data to include all Federal or Federally-assisted construction projects, rather than being limited to Federal dams and reservoir sites.

10. U.S. Department of Transportation, *Procedures for Considering Environmental Impacts,* DOT Order 5610.1B, September 23, 1974. Supplements the CEQ guidelines (see Item 8, above) and provides for the environmental assessment of all transportation programs and projects undertaken or supported by U.S. DOT and its modal offices.

11. Federal Highway Administration, *Federal-aid Highway Program Manual.* The Federal-aid Highway Program Manual contains all FHWA program directives which govern the Federal and Federal-aid highway programs. These directives were formerly issued as Policy and Procedure Memoranda (PPM's) and Instructional Memoranda (IM's), etc.

    The Program Manual is divided into seven volumes. While every volume contains items of interest to persons involved in transportation planning and environmental assessment, Chapter 7 of Volume 7, entitled *Environment,* contains the directives of greatest relevance. The contents of Chapter 7 are listed below:

    Volume 7, Chapter 7: *Environment*

    Section 1: Process Guidelines (for the development of Environmental Action Plans)

    Section 2: Environmental Impact and Related Statements

    Section 3: Noise Standards and Procedures

    Section 4: Archeological and Paleontological Salvage

Section 5: Public Hearings and Location/Design Approval

Section 6: (Reserved)

Section 7: (Reserved)

Section 8: Joint Development of Highway and Multiple Use of Roadway Properties

Section 9: Air Quality Guidelines

12. Council on Environmental Quality, *102 Monitor*. In its capacity as the administrator of NEPA, CEQ publishes a monthly listing of all draft and final Environmental Impact Statements received by the Council. In addition, the 102 Monitor contains a list of the Environmental Protection Agency's comments on pending EIS's (filed under the provisions of Section 309 of the Clean Air Act); items of current concern in NEPA case law; and information on the environmental programs of the Council.

HIGHWAY BEAUTIFICATION ACT OF 1965*

Title II of the Highway Beautification Act provides for the control of junkyards which are within 1,000 feet of the nearest edge of the right-of-way and visible from the traveled way of the interstate and Federal-aid system.

The act also provides reimbursements to the states, the District of Columbia, and Puerto Rico for 75 percent of eligible landscaping and screening costs and for 75 percent of the cost of just compensation for the relocation, removal or disposal of those junkards which cannot as a practical matter be screened.

The law further stipulates that the states must enact legislation to control future junkyard locations through licensing and zoning, and thereby avoid the expense of bringing new facilities into compliance.

Junkyards located in industrially zoned areas or in unzoned industrial areas of similar character are exempt from control under the Federal law.

Failure by the states to comply with the provisions of the Highway Beautification Act could subject them to a penalty of a 10 percent reduction of their annual Federal-aid highway funds.

To determine the extent of the problems adjacent to the Interstate and Federal-aid primary systems, all 50 states, the District of Columbia, and Puerto Rico have made a detailed inventory of all junkyards adjacent to these systems as of October 22, 1965. The inventories show that approximately 80 percent of the junkyards can be concealed from the main traveled way by natural objects, plantings, fences, or other means. The remaining 20 percent must be relocated, removed, or otherwise disposed of.

Each location to be screened must be treated individually to meet the specific condition. It is not the intent to conceal a place of active business but merely to soften the visual impact of the exposed junk. The screening should extend beyond and blend with the immediate area. The following general types of screening warrant consideration.

1. Highway border plantings of trees, shrubs, etc., of a size and density that will largely impair view across the right-of-way line.

2. Earth mounds graded and rounded to a reasonably natural appearance and planted with grass or nonmowing ground cover.

3. Open wire, chain link, wood, or other fences covered with vines to provide the effective screen.

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*This reading has been adapted from *Junk and Control: Highway Beautification Act of 1965*. U.S. Department of Transportation, Federal Highway Administration, 1967.

4. Open wire, chain link, wood, or other fences with inserted light metal, wood, or plastic strips to provide the screen cover.

5. Solid or semisolid fences such as board, picket, or sapling wood types; metal with lightweight panels, expanded mesh, and other commercially available types (100 percent screen at all angles of view is not considered essential): or other available materials such as fiber glass or asbestos board panels.

6. Walls, preferably pierced or open type, of stone, brick, concrete block, or some combination of materials in keeping with the general area, limited to practical heights.

7. Combinations of the above.

When planting alone is used, it is more desirable and economical to provide an open screen effect. Glance views of junkyards at normal highway speeds are not objectionable. A solid screen may be unnatural and inappropriate in relation to the adjacent roadside vegetation and development. Plants should be of varieties comparable to those which exist in the area. Fully mature trees should rarely be used as they may have a low survival rate. Plants should be of a variety that will grow relatively fast so that effective screening is attained within a 2- to 5-year period. In many instances, planting may be accomplished within the presently owned State right-of-way. Where this cannot be accomplished, it will be necessary to arrange with the owner to screen the junkyard on his property.

BENEFICIAL EFFECTS OF HIGHWAYS ON THE ENVIRONMENT*

Well, are we paving the country?

Far from it. All roads, including city and suburban streets, occupy less than one per cent of the land area in the United States. Federal studies in nearly 50 larger cities show that the percentage of land occupied by roads in developed areas is declining. The land is being used for larger lots, more open spaces, landscaped areas. Overall, even with the growth of new arterial highways and expressways, roads take up no greater percentage of the nation's urban areas than they did before the auto was invented.

But aren't we still building a lot of new highways?

Not as many as it would seem. The great bulk of our work, carried out by the New York State Department of Transportation and other transportation agencies throughout the nation, is being done on or near existing roads. Only a small part of our total highway construction mileage involves building roads through totally new areas.

Well, then, why are we spending so much on highway work?

Roads become worn out and outmoded. We have more people, more vehicles and, most importantly, more usage of these vehicles all the time. A highway built in the 1920s or 1930s in a rural area may well be a congested, dangerous route today, bordered by mushrooming residential or commercial development. Such a road, and there are many of them, should be replaced with a safe highway built for today's traffic demands and the demands of the future.

The interstate highway system now coming into being throughout the nation is adding 42,500 miles of new expressways. This is only a bit more than one per cent of the nation's road and street mileage, but it will carry more than 20 percent of the travel. This means freeing older roads of congestion, making all highways easier to travel and safer. In New York State, with all but 15 percent of its 1,350 miles of interstate highways in service, these new highways are removing traffic pressures in both rural and urban areas, saving time and money for highway users. Most of all, they are saving lives. Federal officials report that a life is saved each year for every five miles of new interstate highway placed in service. For New York State, that means 230 lives a year being saved now and 270 lives when the system is completed.

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*This reading consists of excerpts from "Are we Paving the Country?" distributed by the State of New York Department of Transportation and "Benefits of Interstate Highways," distributed by the U.S. Government Printing Office.

Couldn't a lot of this highway travel be accomplished by public transportation?

It can be and is, in the large cities. Elsewhere, the private passenger car is the workhorse of passenger transit, accounting for 98 percent of the intercity travel. In most cities, public transit means buses--and they need highways too. Even in the metropolitan areas, cars are needed to get to airports, train and subway stations, bus stops. The fact is that the private car gives a freedom of mobility and wide open schedule for travel that makes it the most used mode of transportation by far.

Large-scale technological improvements such as the interstate highway system often result in profound and sometimes irreversible changes in the natural and manmade environment. Interstate highways can play a vital role in protecting and enhancing the desirable elements of the physical environment, for example, by increasing opportunities for people to enjoy the beauty and uniqueness of the environment, through greater accessibility. Independent alignment of dual lane interstate highways improve erosion control, restriction of billboard advertising, and selective tree trimming, all contribute toward increasing opportunities for enjoyment of the environment while protecting its ecological structure. Also, highway agencies frequently develop or assist in programs to protect environmental features of scenic, historical, educational, recreational, symbolic, or ecological significance. For example, a number of states have used interstate construction to create recreational lakes from excavations for highway construction, rest areas utilizing Indian mounds, dinosaur tracks, or other historic or natural features.

Interstate highways can have a significant beneficial impact in reducing air and noise pollution in urban areas. Interstate highways, often constructed to bypass downtown areas, reduce unnecessary travel through downtown areas where existing noise and air pollution levels are high. Also, interstate highways eliminate considerable pollution and noise effects of stop-and-go traffic on city streets. The following (from the *American Roadbuilder,* January 1969) shows the dramatic improvements expressways can make in reducing automobile carbon monoxide emissions.

Type of Traffic Situation	*Pounds of Carbon Monoxide per Vehicle Mile*
Expressways	0.11
Arterial streets	.22
Local streets	.27
Central business district	.42

The primary reason for this very significant difference in carbon monoxide emissions is that the amount of unburned gasoline increases sharply when an engine is accelerated or decelerated. For example, when an automobile is cruising less than 2 percent of the total fuel supplied to the engine is emitted unburned through the exhaust pipe. During deceleration, this increases dramatically to 18 percent. Average speed also plays an important role. A change in speed from 20 mph to 30 mph yields

a one-third reduction in total emissions. Air pollution emissions are at a minimum when vehicles are traveling at a relatively constant speed such as on interstate highways. Similarly, interstate highways reduce the more disturbing peak noise levels created by trucks and other noisy vehicles by reducing the need for acceleration and deceleration generally characteristic of travel on neighborhood streets.

Recent advances in the design of interstate highways not only make them more esthetically appealing, minimize neighborhood social and economic disruption, but are also beneficial in terms of reducing air and noise pollution levels. For example, a modern, well designed, elevated structure is visually pleasing, does not inhibit mobility and reduces noise levels in nearby areas. Depressed areas also reduce noise levels. Some interstate highways are now being designed with exclusive bus lanes which will reduce air and noise pollution by decreasing the number of autos and by providing free-flowing bus traffic. Interstate highways help reduce air pollution levels in urban areas by another indirect way. The relationship between interstate highway improvements and industrial decentralization is well known. Both the benefits and hardships of the movement of industry from the center city have been well documented. Evidence is mounting that urban air pollution problems are caused not only by the presence of such things as smoke stacks and automobiles, but by the overall spatial and temporal arrangement of these urban elements--in short by urban form.

USE OF AIRCRAFT TO HELP THE ENVIRONMENT*

Many of the positive effects aircraft have on the environment take place in relatively unpopulated areas, thereby escaping notice of the public in general. Occasionally, headlines may highlight some spectacular happening, involving aircraft, but the day-in, day-out operations take place with little fanfare. These routine aircraft operations affect the environment beneficially in the following ways.

Agriculture

Airplanes and helicopters apply seeds, fertilizers, herbicides, insecticides and growth regulators to various crops. Aircraft are able to give better coverage to the crops and can accomplish the work more quickly and effectively than ground operated equipment. In addition, many farmers are utilizing aircraft for planning and checking on farming operations.

Today practically all rice is sown from the air, along with barley, wheat, alfalfa, ladino clover and many other small-seeded plants. Tomatoes are dusted when fields are wet, before worms can cause damage. Weeds, such as blue mustard, can be controlled. This weed can reduce wheat yield by 20 bushels per acre through the existence of only nine weed plants per square foot. During and after spring rains, aircraft can make these applications without destroying newly sprouted crops or becoming mired in the mud which would entrap ground vehicles.

Even better quality, more reasonably priced clothing, can result from agricultural spraying. The boll weevil, scourge of the cotton planter in the early 20th century, has been all but eliminated through aerial application of pesticides. Defoliating agents applied to cotton plants prior to picking allow mechanical harvesters to pick bolls relatively free of leaves and other extraneous plant material. The absence of these impurities allows fewer processing actions, longer staple length, and, ultimately, a better product.

Livestock Production

The airplane has long been one of the livestock producer's handiest tools. Inventory and control of herds is now regularly accomplished from the sky, covering in a matter of hours what would have taken days or weeks by horseback.

When winter blizzards howl across the plains, piling deep snow drifts and cutting herds off from food supplies, aircraft lift hay and grain to stranded animals. Aside from the aversion of economic loss to the rancher, cattle are saved for market, thereby assuring more plentiful and less costly beef to the consumer.

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*Adapted from *Aircraft and the Environment*, Federal Aviation Administration.

Forest Management

In 1971, the U.S. Forest Service flew a total of 96,539 hours; 75,984 in fixed-wing aircraft, and 20,555 in helicopters. Of this total, 73,897 were flown in fire control activities, 5014 in timber management, and 3581 in engineering work with the balance for miscellaneous activities. In addition to government activities, private timber companies utilize aircraft extensively for management of their reserves.

Firefighting Activities

As indicated by the aforementioned statistics, forest fire control activities utilize the largest percentage of aircraft hours flown. In 1971, the Forest Service fought 2812 forest fires with the help of aircraft. Aircraft enable rapid investigation of the extent of fires and provide a picture of the best access to and means of fighting a fire once one starts. Aircraft provide a rapid method of fire-fighting by dumping borate or water, versus having ground-based fire fighters drive to the area with the attendant time delay in ground transportation. The Canadian "scooper duper" amphibian fire bomber can drop 252 tons of water in 5 hours. Helicopters are used to transport personnel to the fire area, permitting fighting of the fire while it is still in the early stages and often preventing its spread. When helicopters are unavailable or unsuitable, airplanes often carry "smoke jumpers"--specially trained parachutists who can quickly get into otherwise inaccessible areas. Aerial observation of a fire in progress enables a rapid and accurate method of directing ground personnel in their fire fighting efforts.

By saving millions of acres of valuable timber from the devastating effects of fire, a more plentiful supply of lumber is available for home building and other purposes.

Forest Seeding and Fertilizing

After trees have been cut from a forest area, sound management practices dictate a reforestation effort in order to preclude erosion and to establish a new stand of timber for future harvesting. Hand planting of seedlings is effective, but time-consuming and costly. Aircraft, dropping pine, fir or other evergreen seeds, can cover cut-over areas in a matter of minutes. Although many seeds do not germinate, experience has proven that enough will to do an effective replanting job. Once seeds have been sown, fertilizers are applied from the air to promote rooting and plant growth.

Insect/disease Control of Forest Areas

Trees, like other living plant life, are susceptible to infestation by borers, insects, fungus and other damage-causing bodies. Plant diseases, like human diseases, can assume epidemic proportions and can wipe out large forest areas if not brought quickly under control. Such diseased forest areas are quickly detectable from the air through the use of techniques such as infrared photography and other sophisticated methodology. Once detected, forests can be sprayed by aircraft to eliminate disease threats.

Selective Logging Practices

Normal logging practices often cause great devastation to forest areas. Numberous roads must be cut to allow access to logging trucks, bulldozers and other heavy equipment. Areas are clean cut to allow easy retrieval of marketable timber. The results are often scarred and eroded hillsides, unsightly piles and brush and felled trees too small to be of value, and destruction of natural wildlife cover. Although still in the developmental stages, aircraft have shown the potential to change this.

Helicopters, and in a few instances, aerial balloons, are being used to lift logs from cutting areas to a central collection point. This eliminates the need for roads and allows selective cuttings of only marketable trees. It also allows previously inaccessible areas to be selectively logged without destroying their surroundings.

Game Management

Aircraft add a great deal of flexibility in the area of game management. More accurate inventories are possible from the air. Animals can be tagged, studied and redistributed to more provident areas through the use of aircraft. In wintry weather, where starvation becomes a real threat, hay and other foodstuffs can be air-dropped at strategic locations. And, to the delight of the avid angler, remote lakes are stocked with fish.

Weather Control

Present weather experimentation, such as cloud seeding by aircraft, will undoubtedly some day allow man to more effectively control his environment. Already man can produce rain in some dry areas with some degree of assuredness. Experiments with fog dispersal are also underway. Through the use of high-flying aircraft, man can also effectively monitor such things as radiation levels, particulate matter, and upper-air moisture content. Aircraft constantly penetrate hurricanes and thunderstorms to learn more of the destructive effects of nature. Through increased knowledge, man will be able to save untold suffering and property damage now inflicted by natural forces.

Energy Related

The rising demand for more energy; electricity, gas, oil, and coal by the American public will undoubtedly require more transmission lines to move it from its source to its ultimate consumer, e.g., the controversial Alaska pipeline. Helicopters are already extensively used for transporting and erecting towers and transmission lines and pipeline components in remote areas. Aside from being more economically effective, helicopters allow construction techniques which do minimal damage to the environment.

Once these lines are installed and in operation, aircraft regularly patrol them to inspect for damage or leakage. Quick detection by aircraft of oil leaks, for example, and subsequent movement of repair crews by helicopter would prevent any substantial environmental damage.

Insect Control

Disease-carrying insects, such as the malarial mosquito, once took a large toll in human suffering. By teaming the airplane with effective insecticides, most such threats have been either eliminated or kept in check. The recent ban on widespread usage of DDT as a control agent sent currents of alarm throughout the world. Undoubtedly, other agents will be developed, but without the airplane to apply them, the agents would lose much of their effectiveness since areas such as swamps are virtually inaccessible to other means of transportation.

Efficiency as a People-mover

Aircraft produce fewer pollutants per passenger mile than any other form of motorized transportation we enjoy today, with the exception of rail travel.

As an example of relative pollution intensities, we might compare a New York City to Chicago trip by a B-727 aircraft carrying 100 passengers with a trip by auto carrying 4 passengers. The total amount of emissions is 12.8 pounds per auto passenger compared with 1.9 pounds per aircraft passenger. Economies of scale with the wide-bodied jets reduce this figure even lower.

If the 183,000,000 passengers enplaned by the domestic airlines for 1972 were forced to utilize conventional motor vehicles as an alternative, the increased number of vehicles required and the resultant pollution levels would cause considerably more pollution.

Pollution Spotters

Aircraft today are continuously monitoring antipollution efforts. Oil spills on oceans, lakes and rivers and leakages from off-shore wells can be effectively tracked and control efforts directed from aircraft. Pollution sources in rivers and creeks can be traced from the air, especially when water or surface travel is hindered by rapids, private property rights, and other obstacles. Aircraft also routinely monitor compliance with air pollution standards.

THE EFFECT OF NOISE ON MAN AND THE NATURAL ENVIRONMENT*

It is generally agreed that noise has adverse effects, residents of areas near airports and freeways need no convincing. If we are to restore our peace and quiet we must have sufficient understanding of the effects of noise to direct us to suitable action. This reading describes the effects of noise on man and on the natural environment.

Noise-induced Hearing Loss

How much noise can the human ear tolerate? Attempts have been made to answer this question for continuous noise exposure in work environments. The problem of estimating critical noise levels for transportation noise is more difficult because of its irregularities, for example, airplane departures and landings. The main impact of transportation noise on personal well-being may be its aggravation of a hearing impairment already induced by the noisy work environment. Consider, for example, an individual exposed to high noise levels at work, traveling to and from work, and at home trying to relax or sleep. This endless exposure to noise may hasten the onset of serious hearing losses, nerve damage and poor health.

It is presently an extremely difficult task to specify the allowable exposure for brief and intense (ten seconds) transportation noise exposures. A maximum tolerable limit for the unprotected ear can be set at 120-135 dB. Current data on transportation noise levels suggests that *by themselves* these irregular transportation systems maintain constant high levels of noise (85-90 dB(A) and up for 8 hours per day), then there exists a serious risk of hearing impairment.

Nervous System Responses to Noise

Noise can cause the body to activate its defense system, the autonomic nervous system, which controls many critical bodily processes (heart output, hormone control, digestion). Noise is responded to as a stress, and the more stresses bearing on man at any given time, the quicker the bodily defenses can be overwhelmed. The specific effects noise has been shown to have on man, depending on its intensity and duration, include an increase in muscular tension, sweating, metabolic changes, reduced gastrointestinal activity, nausea, headaches, tinnitus, drowsiness, respiratory irregularities and emotional disturbances. Although these effects are signs of autonomic arousal, this is *not* necessarily dangerous to the organism unless the arousal is maintained for prolonged periods of time causing depletion of bodily defenses.

Sleep Disturbance

One of the chief complaints about transportation noise is its disturbance of sleep and relaxation. The major offender is the airplane, owing

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*The reading has been adapted from *Transportation Noise Pollution: Control and Abatement*--edited by David O. Dickerson, 1970. Summer Faculty Fellowship Program in Engineering Systems Design, ASEE-NASA Langley Research Center, Old Dominion University Research Foundation.

to its loudness and unexpectedness. Disturbance of sleep is of primary importance because of its necessity for normal psychological and physiological functioning. Aggravated sleep loss has a profound effect on body health, particularly for the aged and the sick, and can become a significant factor in personal well-being. Testimony before a state legislative committee on jet noise in New York cited paranoid delusions, hallucinations, suicidal and homicidal impulses as some of the possible consequences of continuous sleep loss.

The levels of noise that sleepers can tolerate vary widely. A mother is awakened by her baby's cries while the father sleeps peacefully. A dripping faucet can prevent sleep. A jet transport screeches overhead and startles the sleeper awake. Although it is not obvious what characteristics are shared by these sounds, certain fundamental rules can be set forth:

- The louder the noise, the greater the disturbance of sleep
- The more meaningful the sound, the greater the chance of disturbance
- The more unexpected the noise, the greater the chance of being awakened
- The greater the presence of certain personality traits, i.e., neuroticism, the greater the sensitivity to noise
- The younger the child, the greater the susceptibility to interference from aircraft noise
- The greater the age or poorer the health, the lower the resistance to noise disturbance

Psychological Effects of Noise

Noise can have a deleterious effect on man's day to day existence. There is no reported research on the psychological effects of transportation noise, but there are some inconsistent findings on noise in the work environment. A large portion of the research concludes that noise causes a significant increase in work errors and the quantity of work produced. The same applies to students in school. Other studies conclude that individuals with high levels of anxiety perform better under noisy conditions than under quiet ones. Most of the research agrees that the psychological effects of noise vary with the quality of the sound--its duration, direction, frequency and unexpectedness.

Effects of Transportation Noise on the Natural Environment

Noise seems to accompany man wherever he goes. Outdoor recreation has become more and more mechanized and more and more noisy. The burgeoning popularity of trail bikes and snowmobiles has taken man into the quiet forest and mountains in a very intrusive and noisy manner.

The noise of snowmobiles terrifies wildlife already immobilized by deep snow and in a weakened condition. The exertion of fleeing through deep snow is harmful and can be fatal. Low flying aircraft also constitute a source of terrifying noise which affects wildlife and farm animals.

THE AIRPORT NOISE PROBLEM*

The major cause of noise complaint in the last 15 years is the noise around airports. Community responses to airport noise are in some ways unique but in others resemble complaints about any noise irritation.

Studies of relations between aircraft noise exposure and annoyance have helped determine major acoustical and sociological factors affecting annoyance. Annoyance in general results from interference with normal living activities from the noise itself and from vibrations it causes in structures. Activities commonly disrupted include TV and radio enjoyment, rest and sleep, conversation, reading or corcentrating, eating and working.

Disturbances can be more insidious and subtle than we may recognize. In one survey a totally deaf man, using sign language, indicated he was unable to sleep because aircraft caused vibrations which shook the house and bed. Residents near major airports have indicated alterations in social relations due to noise. Speech interference has led to friction and hostility among family members and sometimes deterioration of interfamily relationships.

Some of the more important sociopsychological factors known to affect strongly the annoyance produced by a given aircraft noise intrusion include

1. Fear of aircraft crashing
2. General attitude about noise
3. General attitude about residential environment
4. Beliefs about the preventability of aircraft noise
5. Belief in the importance and value of airports and air traffic
6. Belief in the possible effects of noise on health

These factors can be as important as the noise exposure itself in determining annoyance reactions. Thus an individual's reaction to noise seems to be only a part of a more general adjustment to the local environment.

Research suggests that the actions of people sufficiently annoyed with aircraft noise vary from complaining to officials to attempting to abate the effects of noise by keeping windows shut, sleeping with earplugs, and insulating homes. These individual responses mold into community efforts as noise levels and exposure times increase and as it becomes clear that the failure of individual remedies makes a community wide or political solution necessary.

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*The reading has been adapted from *Transportation Noise Pollution: Control and Abatement*--edited by David O. Dickerson, 1970. Summer Faculty Fellowship Program in Engineering Systems Design, ASEE-NASA Langley Research Center, Old Dominion University Research Foundation.

Community reaction to airport noise may be conveniently depicted as a chain of possible events:

EXPOSURE ⟶ ANNOYANCE ⟶ COMPLAINT ⟶ PROTEST

There is no evidence that the people who complain or protest noise are extra-sensitive to that noise, but they do tend to be more convinced that the noise could be prevented and that it affects their health.

THE NOISE CONTROL ACT OF 1972*

Background Legislation

Recognition that noise is an environmental problem that affects people other than workers has been late in coming. Federal noise legislation first appeared in 1968 when Congress directed the Federal Aviation Administration (FAA) to establish rules and regulations to control aircraft noise.

At the state and local level, laws tended to treat noise as a public nuisance, and enforcement was both difficult and spotty. More recently some jurisdictions, notably California and Chicago and New York City, have established new laws and ordinances that are based on noise generating characteristics of specific equipment and, hence, are easier to enforce.

The Clean Air Amendments of 1970 called for the establishment of an Office of Noise Abatement and Control in the U.S. Environmental Protection Agency (EPA). The legislation also called for public hearings of environmental noise and a special report to the Congress on the problem, incorporating the results of the public hearings and other special studies. Information from this EPA report as well as extensive Congressional hearings formed the basis of the Noise Control Act of 1972.

The Noise Control Act of 1972

The Noise Control Act of 1972 represents the first major Federal attempt to eliminate excess noise at the design stage of a wide variety of new consumer products.

Major Provisions

The EPA is directed to develop and publish information on the limits of noise required for protecting public health and welfare as well as a series of reports to identify products that are major sources of noise and to give information on the techniques for controlling noise from such products.

Using the criteria thus developed, the EPA Administrator is required to set noise-emission standards for products that have been identified as major sources of noise and for which standards are deemed feasible. The law requires such standards to be set for products in the categories of *construction equipment, transportation equipment* (except aircraft), *all motors and engines, and electrical and electronic equipment*. It also grants authority to set for other products, standards deemed feasible and necessary to protect public health and safety.

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*Taken from the *Noise Control Act of 1972; Highlights*. Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402

EPA has authority to require the labeling of domestic or imported consumer products as to their noise-generating characteristics or their effectiveness in reducing noise-generating characteristics or their effectiveness in reducing noise. Manufacturers or importers of non-conforming or mislabeled products are subject to fines of up to $25,000 per day for each violation and to imprisonment for up to one year. Manufacturers must issue warrants that their regulated products comply with Federal standards at the time of sale. They are also required to maintain records and provide information, including production samples, if requested by EPA.

The EPA Administrator also is to prescribe noise-emission standards for the operation of *equipment* and *facilities* of *interstate railroads*, *trucks*, and *buses*.

All Federal agencies are directed to use the full extent of their authority to insure that purchasing and operating procedures conform to the intent of the law. EPA may certify low-noise emission products for purchase by the Federal government.

Aircraft Noise

Under the Noise Control Act of 1972, the EPA Administrator is required by mid-1973 to make a comprehensive study of aircraft noise and cumulative noise exposure around airports. Using this information, EPA is to submit to the FAA proposed regulations to control aircraft noise and sonic booms. After a hearing and further consultation with EPA, the FAA may adopt or modify the proposed regulations. The FAA may reject the proposals if it believes they are unsafe, technologically or economically infeasible, or not applicable to certain aircraft. However, it must publicly explain its specific reasons for rejection. A continuing review and consultation role is provided for EPA.

An End to Noise Pollution

This comprehensive nature of the Noise Control Act of 1972 brings under Federal regulation for the first time, nearly all of the major new sources of noise. An incentive now exists for the full employment of noise-control technology that is already available, and the day when quiet is restored appears closer. We know how to build quieter. Now the law is to give the nation the stimulation to do it.

TRANSPORTATION AND ENERGY CONSERVATION*

Transportation is a high-energy function. Approximately 60 percent of the liquid fuel consumed in the United States is used for transportation purposes.

Within the transportation sector, highway vehicles are the major consumer, accounting for nearly 40 percent of all the petroleum used in the United States.

1974 GASOLINE CONSUMPTION

Vehicles		*Barrels/day*
Passenger cars		
Getting to work		1,760,000
Pleasure driving		1,360,000
Personal business		1,020,000
Business, government		800,000
	Subtotal	4,940,000
Trucks		1,470,000
Farm vehicles		200,000
Other uses		200,000
	Total	6,810,000

Transportation's petroleum requirements *doubled* between 1954 and 1974.

Ninety-two percent of the more than 2.4 trillion "person miles" of travel annually in the United States are by automobile.

Seventy percent of all travel in the United States is by automobile; 27.6 percent by commercial air transportation; 1.5 percent by bus, and 0.5 percent by passenger rail.

Motor vehicles, therefore, are of paramount significance in U.S. fuel conservation efforts, because they are the predominant users.

In 1970 oil imports cost the United States $2.7 billion. In 1974 the U.S. paid *$23.6 billion* for the oil needed to bridge the difference between domestic production and nationwide demand.

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*This reading has been adapted from a U.S. Department of Transportation Fact Sheet of June 10, 1975.

From the days of oil surpluses in the 1960's, the United States has moved to a dependency situation. In 1974 imports were needed to supply 37 percent of our petroleum needs; unless conservation, energy conversion, and energy efficiency efforts succeed, U.S. dependency on foreign oil could rise to 50 percent by 1980.

While estimates of undiscovered oil reserves vary greatly, the known recoverable reserves of U.S. oil are reported to be 45 billion barrels. In view of contemporary consumption rates, limited reserves, and declining domestic production, petroleum independence is not attainable as a short-term goal.

Fuel conservation is essential for economic as well as for supply reasons. The motor vehicle, as the major user (about 45 percent of the petroleum used annually in the U.S.), is potentially the greatest saver--especially in view of the vast quantities of fuel wasted through carelessness, inefficiency, unnecessary driving, and driving at higher speeds than necessary.

How the 55 mph Speed Limit Saves Fuel

The nation's 105 million automobiles, 26 million trucks, and 400,000 buses consume about 75 percent of the petroleum used for transportation purposes in the United States, nearly 107 billion gallons in 1974.

The government has challenged the auto industry to achieve a 40 percent improvement in fuel efficiency by 1979, to an average passenger car performance of nearly 20 miles per gallon.

Tests by the Federal Highway Administration* show improvements in automobile fuel economy ranging from 11.8 to 28.5 percent by driving at 55 mph rather than 70 mph, depending on the size of the car.

COMPARATIVE CONSUMPTION RATES

Miles/hour	*Subcompact*	*Compact*	*Standard*	*Luxury*
30	31.45 mpg	21.33 mpg	20.33 mpg	18.33 mpg
40	35.19	21.33	20.00	19.28
50	33.05	18.94	17.50	15.62
55	31.91	18.17	16.84	14.92
60	30.78	17.40	16.17	14.22
70	22.82	15.36	14.86	12.74

*"Effects of Speed on Automobile Gasoline Consumption Rates," a Federal Highway Administration mileage study. Copies available on request from the FHWA, Washington, D.C. 20590, Attention: HPA-1.

About half of all vehicle miles are driven under conditions where speeds above 55 mph are possible. The potential savings if 90 percent of the driving population comply with the 55 mph speed limit are estimated at 200,000 barrels of gasoline per day--20 percent of the total savings advocated by President Ford for 1975.

Average interstate speeds declined 7.5 mph in 1974. Surveys show that only 6 percent of highway vehicles exceeded 65 mph in 1974, compared to 31 percent in 1973. An important part of the 3.4 percent reduction in gasoline consumption in 1974 was due to lower speeds.

BIBLIOGRAPHY

The bibliography contains educational materials for teachers and students. It contains several types of readings:

- Student materials (pamphlets, books)--many of which also can be profitably read by teachers
- Background materials for teachers on transportation and the environment
- Relevant periodicals

The individual entries in the teacher and student materials sections are presented in the following format:

**76.	*Title of Work*, author, date of publication. Number of pages or list of materials. Price.
Type of Material	Description of material with evaluation of its quality and relevance for transportation and environmental education. Source from which material may be obtained.*

For purposes of convenience, the teacher and student materials have been rated by the designation of stars next to the material description (see sample above). The stars represent the following evaluation:

no stars	material is useful, but fair
(*) one star:	material is good
(**) two stars:	material is very good
(***) three stars:	material is excellent

It should be kept in mind that these evaluations are an estimation of the material's *quality and relevance*.** As such, the absence or low rating of teaching material does not indicate the material itself is poor. It may be excellent but simply not very relevant. In addition, any absences may be due to the authors' oversight.

At the end of the bibliography is a list of government agencies that can be contacted for further information about transportation and the environment.

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*Allow ten weeks for delivery of items ordered from the U.S. Government Printing Office.

**A complete discussion of the criteria used to evaluate the materials may be found at the end of the Manual.

STUDENT MATERIALS

*1. *Needed: Clean Air; The Facts About Air Pollution,* 1972. 15 pages. 25¢.

Pamphlet Useful but very sketchy overview of the effects of air pollution on health, energy depletion, and economic costs. Transportation is included as one of the sources of pollution. Some students may find the cartoon format condescending or childish.

Channing L. Bete Co., Inc.
45 Federal Street
Greenfield, Massachusetts 01301

**2. *Health Effects of Environmental Pollution,* 1973. 20 pages. 30¢.

Pamphlet Highly useful overview of the effects of air, water, and noise pollution on human health.

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

*3. *Cost of Air Pollution Damage: A Status Report,* 1973. 73 pages. $2.50.

Pamphlet A review of studies on the cost of air pollution damage on human health, vegetation, materials, and residential property values. Transportation pollution is not singled out. Very analytical.

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22151
Stock Number PB-222 040

4. *Transportation Noise and Its Control,* 1972. 27 pages. 70¢.

Pamphlet Informative, not too technical discussion of the nature of noise pollution, the decibel unit of measurements, the extent of noise caused by cars, trucks, planes, and rapid transit and possibilities for reducing or eliminating transportation noises.

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402
Stock Number 50000-0057

**5. *Transportation Noise Pollution: Control and Abatement*, 1970. 190 pages. $6.00.

Pamphlet Very informative, in places technical discussion of the causes of transportation noise pollution and what can be done about them. Excellent charts, graphs, and cartoons.

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22151
Stock Number N71-15557

6. *Noise and You*, 1970. 15 pages. 25¢.

Pamphlet Brief overview of the nature of noise and the dangers of too much and too loud noise. Not tied in specifically with transportation noise. Informative, but in a cartoon format that some students may find condescending or childish.

Channing L. Bete Co., Inc.
45 Federal Street
Greenfield, Massachusetts 03101

7. *Junkyard Control: Highway Beautification Act of 1965*, 1967. 15 pages. Free.

Pamphlet Two-page description of provisions of the Act as they affect junkyard control. Other pages provide "before and after" photographs of junkyards with and without adequate screening from highway viewing.

U.S. Department of Transportation
Federal Highway Administration
Bureau of Public Roads
400 7th and D Streets, S.W.
Washington, D.C. 20590

8. *Superhighway--Superhoax*, by Helen Leavitt, 1970. 95¢.

Book A polemic with facts about Federal highway programs, funding and operations; cites problems and issues in localities throughout the U.S.; special chapter on urban highway problems; information on alternative transit systems. (Not evaluated.)

Ballantine Books, Inc.
201 E. 50th Street
New York, New York 10022

*9. *Park and Recreational Facilities: Their Consideration as an Environmental Factor Influencing the Location and Design of a Highway*, 1971. 47 pages. 45¢.

Pamphlet — Informative discussion of what criteria should be considered when building a highway to protect playgrounds, parks and parkways.

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

**10. *Community Involvement in Highway Planning and Design*, 1973. 53 pages. Price not listed.

Conference Proceedings — Conference proceedings with informative discussion on the adequacy of public hearings, the characteristics of an effective pre-hearing community involvement program, and what actions can be taken to achieve early and effective public involvement.

U.S. Department of Transportation
Federal Highway Administration
Office of Environmental Policy
400 7th Street, S.W.
Washington, D.C. 20590

*11. *Community Participation in Highway Planning*, 1972. 59 pages. Price not listed.

Report — Recommendations to the Department of Transportation on how to promote citizen participation in highway planning efforts. Also discusses such issues as how citizens can become motivated to particiate in planning and how one can find representative, indigenous leaders who will represent a community in the planning process.

U.S. Department of Transportation
Office of Consumer Affairs
400 7th Street, S.W.
Washington, D.C. 20590

**12. *Readings for the Eco-activist*, 1972. 41 pages. Price not listed.

Bibliography — A bibliography of environmental publications of the Federal government for young persons interested in involvement in environmental problems. There are chapters on air, water, and noise pollution that include materials on transportation pollution.

Division of Information Services
Office of Library Services
U.S. Department of the Interior
Washington, D.C. 20240

**13. *Groups that Can Help: A Directory of Environmental Organizations*, 1972. 12 pages. Free.

Directory — Extremely useful listing of organizations which can be contacted by individuals seeking information and advice on environmental problems, including problems created by transportation.

U.S. Environmental Protection Agency
Office of Public Affairs
Waterside Mall
Washington, D.C. 20460

14. *Aircraft and Air Pollution: Selected Readings*, 1971. 61 pages. Price not listed.

Bibliography — Bibliography of papers, reports, and periodical articles on environmental pollution caused by airplanes.

Department of Transportation
Office of Administrative Operations
Library Services Division
400 7th Street, S.W.
Washington, D.C. 20590

BACKGROUND LITERATURE FOR TEACHERS ON TRANSPORTATION AND THE ENVIRONMENT

Most instructors who plan to teach a unit on transportation and the environment will need to do some preliminary reading in the field in order to teach effectively. However, an encyclopedic knowledge of the facts is not necessary to teach this subject effectively. You do not need to be an expert, for example, on the chemical nature of automobile exhaust pollution. The more students learn about transportation and the environment through their own efforts, the more they are likely to retain their knowledge and skills and be able and motivated to put them to work.

To gain a working background about transportation and the environment we suggest three steps:

1. Read Chapter III in this Manual, "Readings on Transportation and the Environment."

2. Read all the Lecture Activities; they present in outline form most of the information you will need to know.

3. Purchase or obtain from the library one (or more) of the books listed below and read it, skimming the sections whose technical level or detail exceed your interest level and needs.

*1. *Vanishing Air*, by John C. Esposito, 1970. 328 pages. 95¢, paperback.

Paperback — Highly critical account of government's attempt to regulate air pollution and industry's alleged attempts to avoid self-regulation. Chapter 1 on general causes and effects of air pollution and section of Chapter 6 on air pollution from airplanes are relevant and informative. Major attention is paid to automobile pollution; author blames the government for not enforcing strict standards, and the industry for not taking actions of its own and attempting to obviate Federal and state controls.

Grossman Publishers, New York
125A East 19th Street
New York, New York 10003

2. *Cost of Air Pollution Damage: A Status Report*, 1973. 73 pages. $2.50.

Pamphlet — A review of studies on the cost of air pollution damage on human health, vegetation, materials, and residential property values. Transportation pollution is not singled out. Very analytical.

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22151
Stock Number PB-222 040

3. *Air Pollution Primer,* 1969. Price varies.

Pamphlet Handbook that explains air pollution's processes, sources, characteristics, and effects. Special sections on weather and radioactivity.

Available from local
Tuberculosis Association

4. *Air Pollution Workbook,* 1970. $1.00.

Pamphlet Concise explanations of the atmosphere, characteristics of specific pollutants, biological effects of pollution; bibliography and references.

Scientific Institute for Public Information
30 East 68th Street
New York, New York 10021

5. *Noise Pollution,* 1972. 13 pages. 35¢.

Pamphlet Informative discussion of what sound is, how it affects our health, and general ideas for solutions. Noises from transportation pollution sources are discussed.

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402
Stock Number 5500-0072

*6. *Transportation Noise and Its Control,* 1972. 27 pages. 70¢.

Pamphlet Informative, not too technical discussion of the nature of noise pollution, an explanation of the decibel unit of measurements, and the extent of noise caused by cars, trucks, planes, and rapid transit and how such noise can be reduced or eliminated.

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402
Stock Number 50000-0057

**7. *Transportation Noise Pollution: Control and Abatement,* 1970. 190 pages. $6.00.

Pamphlet Very informative, in places technical discussion of the causes of transportation noise pollution and what can be done to eliminate or reduce them.

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

*8. *The Tyranny of Noise*, by Robert Alex Baron, 1970. 294 pages. $7.50.

Book Comprehensive account of causes of noise pollution, price in terms of health, dollars, and environmental quality, political aspects of noise pollution control, and citizen actions to promote noise abatement. Section on citizen actions is detailed and very useful, but somewhat idealistic.

St. Martin's Press, Inc.
175 Fifth Avenue
New York, New York 10010

9. *Noise: The Unseen Enemy*, 1972. 63 pages. $1.00.

Book Overview of the noise pollution problem, with discussions of what sound is, physical and psychological effects, and supersonic aircraft noise. Well illustrated, but little of booklet deals with transportation noise pollution per se.

Pendulum Press, Inc.
The Academic Building
Saw Mill Road
West Haven, Connecticut 06516

*10. *The Noise Control Act of 1972: Highlights*, 1972. 4 pages. Free.

Flyer Provides background to the legislation and the major provisions of the Noise Control Act.

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

**11. *Dead End: The Automobile in Mass Transportation*, 1972. 231 pages. $1.45.

Book Comprehensive discussion of role of automobile in contemporary American life and detrimental effects it has had. Included are discussions of the energy problem, air pollution, freeways, and alternatives to the automobile.

Penguin Books Inc.
7110 Ambassador Road
Baltimore, Maryland 21207

*12. *Unsafe At Any Speed*, by Ralph Nader, revised edition, 1972. 367 pages. $1.95.

Book New edition of now classic study of automobile industry's lack of attention to safety. Chapter 4, "The Power to Pollute," attributes the failure to control automobile pollution to the industry delays,

collusion, and miserliness. Book as a whole is indispensable for one view toward responsiblity for pollution and attempts to control it, even though most of book is about automobile safety.

*13. *The Accessible City*, by Wilfred Owen, 150 pages. $2.95.

Book General discussion of big city transportation problems, with emphasis on rational planning to avoid problems. Chapter on public transport provides useful background information on one alternative to the automobile. Sections on transportation planning consider environmental concerns of land use and esthetics.

The Brookings Institute
1775 Massachusetts Avenue
Washington, D.C. 20036

**14. *Automotive Fuels and Air Pollution*, 1971. 32 pages. 40¢.

Pamphlet Detailed account, for the layman, of automobile pollutants, their effects, and what can be done to eliminate or reduce them.

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

***15. *Rites of Way: The Politics of Transportation in Boston and the U.S. City*, by Alan Lupo, Frank Colcord, and Edmund P. Fowler, 1971. 294 pages. $3.95.

Book Detailed account of how community opposition in metropolitan Boston forced the state and local governments and quasiindependent commissions to abandon plans to construct freeways in and around the city. Book also discusses who makes transportation decisions in other major U.S. cities and the politics of such decisions. Excellent example of citizen action seeking to alter the environmental effects of transportation decisions on population displacement, traffic congestion, land use, and esthetics.

Little, Brown and Company
34 Beacon Street
Boston, Massachusetts

**16. *Benefits of Interstate Highways*, 1970. 28 pages.

Pamphlet Report to Congress describing user, economic, and community benefits deriving from interstate highway construction.

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

*17. *The Federal-aid Highway Program,* 1975. 7 pages. Free.

Flyer Brief description of the nature of the Federal government's aid to states for highway construction, including mention of how citizens can influence highway decisions, laws providing compensation for persons displaced by highway construction, and laws to protect the environment.

U.S. Department of Transportation
Federal Highway Administration
400 7th and D Streets, S.W.
Washington, D.C. 20590

**18. *Your Rights and Benefits as a Highway Relocatee Under the Federal Relocation Assistance Program,* 1974. 54 pages. Free.

Pamphlet Discusses possible reimbursement for moving costs and obtaining comparable replacement housing for both homeowners, renters, businesspersons and farmers.

U.S. Department of Transportation
Federal Highway Administration
Office of Right-of-Way
400 7th and D Streets, S.W.
Washington, D.C. 20590

**19. *Highways and Our Environment,* by John Robinson, 1971. 332 pages. $24.00.

Book Well-written, highly informative, and impassioned account of how highways and the automobiles they serve have blighted the environment with litter, concrete, air and noise pollution, and visual unsightliness. Chapters on citizen action and the highway establishment are useful. One appendix lists citizen action groups and government agencies involved in transportation and the environment. A profusion of valuable photographs makes the work unique.

McGraw-Hill Book Company
1221 Avenue of the Americas
New York, New York 10020

20. *The Freeway in the City,* 1968. Adult. 141 pages. $3.00.

Book Somewhat technical discussion of the principles of urban freeway planning and design that considers environmental concerns in terms of the view from the freeway, location of the freeway, and highway structures. Well illustrated.

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

21. *Park and Recreational Facilities: Their Consideration as an Environmental Factor Influencing the Location and Design of a Highway,* 1971. 47 pages. 45¢.

Pamphlet Informative discussion of what criteria should be considered when building a highway to protect playgrounds, parks, and parkways.

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

**22. *Aircraft and the Environment,* 1973. 13 pages. Free.

Pamphlet Detailed description of the positive effects airplanes have on the environment, from crop spraying to fire fighting. Indispensable supplement to other accounts of airplanes' harmful effects on the environment.

Federal Aviation Administration
Aviation Education Programs Division A6A 300
Office of General Aviation Affairs
Washington, D.C. 20591

*23. *Railroads and the Environment in Rail Freight Operations,* 1972. 28 pages. 30¢.

Pamphlet Concise, informative discussion of railroad pollution and abatement, including odors, engine exhaust emissions, sanitary waste control, and land use. Photographs.

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

*24. *Rethinking Your Automobile,* 1973. 6 pages. Free.

Flyer Brief discussion of consumer's role in reducing use of cars in view of the energy shortage.

Office of Public Affairs
U.S. Environmental Protection Agency
Waterside Mall
Washington, D.C. 20460

***25. *Getting Around: People and the City,* 1974. 48 pages. $1.29.

Pamphlet Informative, thought-provoking case studies and discussions on urban transportation, including commuting, rapid transit, citizen action, dial-a-bus, mass transit, banning cars, and the Bay Area

Rapid Transit (BART) in San Francisco. Discussion questions are provided. Well illustrated; photographs.

Scott, Foresman and Company
1900 Eastlake Street
Glenview, Illinois 60025

26. *Government Approaches to Automobile Air Pollution Control*, 1971. $3.00.

Pamphlet Discusses industry's control of auto emissions, consumer control, and advantages and disadvantages of standard-setting and traffic system designs. (Not evaluated.)

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22151
Publication No. PB203-952

27. *An Anti-Pollution Program: National Gas Powered Vehicles*, 1972. 6 pages. Free.

Pamphlet Report on dual-fuel system in cars enabling them to operate on either natural gas or gasoline. Clean-burning properties of natural gas are explained. Well illustrated.

General Services Administration
18th and F Streets
Washington, D.C. 20405

***28. *A Citizen's Guide to Clean Air*, 1972. 95 pages. Free.

Pamphlet An extremely useful, detailed account of the clean air laws and how citizens can advocate and plan for the control of air pollution. One chapter deals with auto emission controls, another with the citizen's legal rights, and a third with the citizen's role in policy making.

The Conservation Foundation
1717 Massachusetts Avenue, N.W.
Washington, D.C. 20036

**29. *The Campaign for Cleaner Air*, by Marvin Zeldin, 1973. 28 pages. 35¢.

Pamphlet Informative, factual account on clean air, including the Clean Air Act, implementing the law, controlling automobile pollution, and the citizen's role.

Public Affairs Pamphlets
381 Park Avenue South
New York, New York 10016
Pamphlet No. 494

220

30. *Action For Clean Air: A Manual For Citizen Participation in State Implementation Plan Proceedings Under the Clean Air Amendments of 1970*, 1971. Price not listed.

Pamphlet Explains in detail the Act and regulations for implementation plans; makes specific suggestions for action by individuals and by organized citizen groups. Emphasizes legal procedures and citizens' legal rights. (Not evaluated.)

Natural Resources Defense Council
36 West 44th Street
New York, New York 10036

*31. *More Fun Per Gallon: A Guide to Fuel Conservation With an Outboard Powered Boat*, 1973. 16 pages. Free.

Pamphlet Useful tips on how to conserve gasoline while motorboating.

MORE FUN PER GALLON
Marketing Communications Department
Johnson Outboards
200 Sea-Horse Drive
Waukegan, Illinois 60085

*32. *A Citizen's Guide to Clean Water*, 1973. 95 pages. Free.

Pamphlet An extremely useful, detailed account of the clean water laws and how citizens can advocate and plan for the control of water pollution. However, laws and pamphlet deal primarily with pollution from industrial sources, rather than transportation facilities.

Office of Public Affairs
U.S. Environmental Protection Agency
Waterside Mall
Washington, D.C. 20460

*33. *Process Guidelines: The Action Plan*, 1972. 9 pages. Free.

Flyer Brief discussion of state action plans under which states must consider economic, social, and environmental factors when planning highway construction.

U.S. Department of Transportation
Federal Highway Administration
Office of Environmental Policy
400 7th Street, S.W.
Washington, D.C. 20590

**34. *Action for Environmental Quality*, 1973. 21 pages. Free.

Pamphlet Discussion of standards and enforcement measures for air and water pollution.

Office of Public Affairs
U.S. Environmental Protection Agency
Waterside Mall
Washington, D.C. 20460

**35. *Don't Leave it All to the Experts: The Citizen's Role in Environmental Decision Making*, 1972. 19 pages. Free.

Pamphlet Identification of methods by which citizens can protect the environment, including becoming informed, knowing the law, lobbying, fighting for funds, and knowing your rights.

Office of Public Affairs
U.S. Environmental Protection Agency
Waterside Mall
Washington, D.C. 20460

*36. *Citizen Action Can Get Results*, 1972. 20¢.

Pamphlet Three somewhat superficial case studies of how community political action successfully reduced environmental pollution. One case study on air pollution indirectly involves auto pollution. However, the case studies are useful as examples of citizen action, even though they are not directly related to transportation's environmental effects.

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402
Stock Number 5500-0070

*37. *Protecting the Environment in the Federal-aid Highway Program*, 1976. 7 pages. Single copies free.

Flyer Identifies legislation designed to protect the environment from harmful effects of highways, discusses the role of the Federal Highway Administration in carrying out these laws, and suggests how the public can become involved in the effort to protect the environment.

U.S. Department of Transportation
Federal Highway Administration
400 7th and D Streets, S.W.
Washington, D.C. 20590

*38. *In Productive Harmony: Environmental Impact Statements Broaden The Nation's Perspectives*, 1972. 13 pages. Single copies free.

Pamphlet Describes the provisions of the National Environmental Policy Act of 1970 and the nature of an environmental impact statement, including the Environmental Protection Agency's role in a statement's development.

U.S. Environmental Protection Agency
Office of Public Affairs
Washington, D.C. 20460

***39. *Getting Involved in Transportation*, 1976. 12 pages. Single copies free.

Pamphlet Describes the nature of environmental impact statements and offers specific suggestions for how the public can become involved in their formulation and in transportation planning in general.

U.S. Department of Transportation
Office of the Secretary
Office of Environment, Safety & Consumer Affairs
400 7th and D Streets, S.W.
Washington, D.C. 20590

*40. *Community Involvement in Highway Planning and Design*, 1973. 53 pages.

Pamphlet Conference proceedings with informative discussions on the adequacy of public hearings, the characteristics of an effective pre-hearing community involvement program, and what actions can be taken to achieve early and effective public involvement.

U.S. Department of Transportation
Federal Highway Administration
Office of Environmental Policy
400 7th and D Streets, S.W.
Washington, D.C. 20590

**41. *Community Participation in Highway Planning*, 1972. 59 pages. Price not listed.

Pamphlet Recommendations to the Department of Transportation on how to make citizen participation in highway planning effects. Also discusses such issues as how citizens can become motivated to participate in planning and how one can find representative, indigenous leaders who will represent a community in the planning process.

U.S. Department of Transportation
Office of Consumer Affairs
400 7th Street, S.W.
Washington, D.C. 20590

223

**42. *Readings for the Eco-Activist*, 1972. 41 pages. Price not listed.

Pamphlet A bibliography of environmental publications of the Federal government for young persons interested in involvement in environmental problems. There are chapters on air, water, and noise pollution that include materials on transportation pollution.

Division of Information Services
Office of Library Services
U.S. Department of the Interior
Washington, D.C. 20240

**43. *Ecotactics: A Sierra Club Handbook for Environment Activists*, 1970. 287 pages. 95¢.

Book Informative essays on the nature of several different aspects of the environmental crisis, including transportation's effects on the environment. Especially useful for descriptions of methods by which citizens can individually and collectively work to reduce pollution. Many readers, however, will find some of the tactics beyond their ability, energy, or interest, and inappropriate on ethical grounds. Many tactics described with reference to industrial pollution are equally applicable to pollution caused by transportation. Appendices list books, environmental groups and societies, and key Federal agencies of relevance to activists.

Pocket Books
630 Fifth Avenue
New York, New York 10020

*44. *The Voice of the Transportation Consumer: Executive Summary*, 1975. 108 pages. $5.25.

Pamphlet/Report This is a comprehensive and forthright "Report to the Secretary of Transportation on Nationwide Consumer Public Hearings Conducted by the (Department of Transportation) Office of Consumer Affairs during 1971-1974." Presents in summary but highly readable fashion the results of 54 hearings conducted in 34 cities and towns. The report analyzes 1,280 complete questionnaires received at the hearings. The report covers all aspects of transportation, but indirectly treats transportation and the environment. A full report of the hearing results is also available and runs to 656 pages.

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22151
Catalog No. PB 241764

45. Single free copies of the following materials, which have not been evaluated, are available from Public Affairs, Federal Highway Administration, U.S. Department of Transportation, Washington, D.C. 20590.

Cost of Owning and Operating an Automobile

Are We Running Out of Gas?

Car Pool and Bus Pool--Matching Guides

The Effect of Speed on Automobile Gasoline Consumption Rates

PERIODICALS

In addition to the periodicals listed below, teachers and students can also consult in libraries the *Readers Guide to Periodical Literature* for past articles on public transportation.

Changing Times
The Kiplinger Magazine
Editors Park, Maryland, 20782

Consumer News
Federal Office of Consumer Affairs
Superintendent of Documents
U.S. GPO
Washington, D.C. 20402

Consumer Reports
Consumer's Union
256 Washington Street
Mt. Vernon, New York 10550

Environment Action Bulletin
33 East Minor Street
Emmaus, Pennsylvania

Highway and Urban Mass Transportation
Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

IRT Newsletter
Institute for Rapid Transit
Suite 508, 1612 K Street, N.W.
Washington, D.C. 20006

Mass Transit
538 National Press Building
Washington, D.C. 20045

Newsletter of the American Council on Consumer Interests
238 Stanley Hall
University of Missouri
Columbia, Missouri 65201

Of Consuming Interest
Federal State Reports
P.O. Box 986
Arlington, Virginia 22216

Transit Journal
The American Public Transit Association
1100 17th Street, N.W.
Washington, D.C. 20036

Transpo Topics for Consumers
Department of Transportation
Office of the Secretary
Washington, D.C. 20590

Transportation U.S.A.
U.S. Department of Transportation
Office of Public Affairs
400 7th and D Streets, S.W.
Washington, D.C. 20590

GOVERNMENT INFORMATION AGENCIES

For further information about transportation consumer issues, citizens can contact the appropriate agencies within the U.S. Department of Transportation listed below:

AGENCY NAME AND ADDRESS	*TELEPHONE NUMBER*
U.S. Department of Transportation 400 Seventh Street S.W. Washington, D.C. 20590	Office of Public Affairs 202/426-4321
Office of Consumer Affairs Office of the Secretary of Transportation	202/426-4520
Federal Highway Administration (address above)	Public Affairs 202/426-0648
Urban Mass Transportation Administration (address above)	Public Affairs 202/426-4043
Environmental Protection Agency 404 M Street, S.W. Washington, D.C. 20460	Public Information 202/755-0890

BIBLIOGRAPHY EVALUATION CRITERIA

All teacher and student materials that were located were evaluated along two dimensions: *quality* and *relevance*. Quality was defined to include the following components:

- Provision of creative and detailed classroom activities or learning experiences that go beyond the one- or two-sentence "have the students do x, y, z" suggestions
- Development of decision-making skills that may be transferable to other consumer issues
- Attention to affective educational approaches and objectives, not merely cognitive ones
- Emphasis on student initiative and involvement in classroom activities and in the planning of those activities
- A concern-centered approach that predicates learning on the assessment of student concerns and the development and use of classroom activities that initially deal with those concerns
- The provision of a lucid conceptual framework of transportation and environmental education by which teachers can grasp the field and the interrelationships of its components and by which teachers can develop additional activities and units of their own
- A modular, flexible approach that enables teachers to develop activities and units tailored to the needs of their particular students and community
- Provision of accurate, factual information
- A nonmoralistic, noninjunctive approach
- Stress on the needs and problems of minority groups
- An interdisciplinary approach to consumer education

Few curriculum materials combined all these quality ingredients. Many included none or only a few. In some borderline cases where a teaching material contained some quality ingredients, the authors made a subjective evaluation on whether the material contained *enough* of these elements to warrant referencing in the module.

To be considered relevant, a teaching material had to deal in a significant way with transportation and the environment from the point of view of or useful to a consumer. Teaching materials were excluded from the module when their relevance was extremely limited or nonexistent because

- Only a small section of the material dealt with transportation and environmental issues. However, such materials were included when a subsection was of high caliber, dealt with an important aspect of transportation and the environment not covered elsewhere, or was part of an easily accessible and inexpensive unit.

- The material was extremely specific--it dealt with too narrow an aspect of an issue to be useful to teachers or students except in highly specialized courses or units.

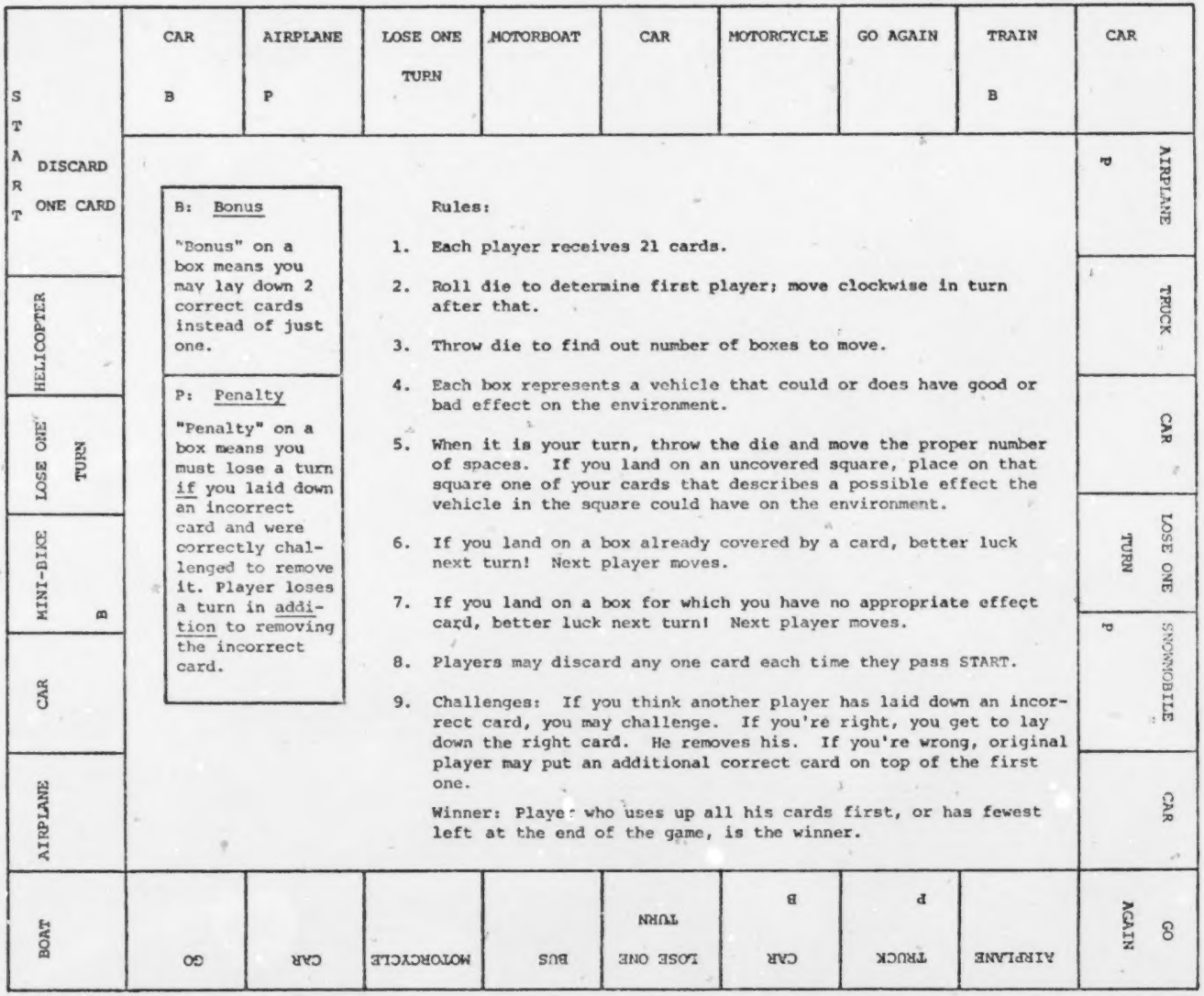
- The material was designed for a highly specialized audience.

- The material was oriented strictly toward career education.

- The material was outdated.

- The material contained information that applied primarily or significantly to a local situation.

- The material was not distributed out of state.


START
DISCARD ONE CARD
HELICOPTER
LOSE ONE TURN
MINI-BIKE B
CAR
AIRPLANE
BOAT
CAR B
AIRPLANE P
LOSE ONE TURN
MOTORBOAT
CAR
MOTORCYCLE
GO AGAIN
TRAIN B
CAR
AIRPLANE P
TRUCK
CAR
LOSE ONE TURN
SNOWMOBILE P
CAR
GO AGAIN
AIRPLANE
TRUCK P
CAR B
LOSE ONE TURN
BUS
MOTORCYCLE
CAR
GO
B: Bonus
"Bonus" on a box means you may lay down 2 correct cards instead of just one.
P: Penalty
"Penalty" on a box means you must lose a turn if you laid down an incorrect card and were correctly challenged to remove it. Player loses a turn in addition to removing the incorrect card.
Rules:
1. Each player receives 21 cards.
2. Roll die to determine first player; move clockwise in turn after that.
3. Throw die to find out number of boxes to move.
4. Each box represents a vehicle that could or does have good or bad effect on the environment.
5. When it is your turn, throw the die and move the proper number of spaces. If you land on an uncovered square, place on that square one of your cards that describes a possible effect the vehicle in the square could have on the environment.
6. If you land on a box already covered by a card, better luck next turn! Next player moves.
7. If you land on a box for which you have no appropriate effect card, better luck next turn! Next player moves.
8. Players may discard any one card each time they pass START.
9. Challenges: If you think another player has laid down an incorrect card, you may challenge. If you're right, you get to lay down the right card. He removes his. If you're wrong, original player may put an additional correct card on top of the first one.
Winner: Player who uses up all his cards first, or has fewest left at the end of the game, is the winner.

PLAYER 1			PLAYER 2			PLAYER 3		
LUNG PROBLEMS	POSSIBLE WEATHER CHANGES	POSSIBLE DEAFNESS	LUNG PROBLEMS	POSSIBLE WEATHER CHANGES	POSSIBLE DEAFNESS	LUNG PROBLEMS	POSSIBLE WEATHER CHANGES	POSSIBLE DEAFNESS
GETTING RID OF GARBAGE	COLLECTING GARBAGE	DIFFICULTY SLEEPING	GETTING RID OF GARBAGE	COLLECTING GARBAGE	DIFFICULTY SLEEPING	GETTING RID OF GARBAGE	COLLECTING GARBAGE	DIFFICULTY SLEEPING
KILLING HARMFUL INSECTS	HEALTH OF PLANTS AND TREES	FIRE FIGHTING	KILLING HARMFUL INSECTS	HEALTH OF PLANS AND TREES	FIRE FIGHTING	KILLING HARMFUL INSECTS	HEALTH OF PLANTS AND TREES	FIRE FIRE FIGHTING
UGLY SCENERY	CHANCE TO SEE SCENERY	DAMAGING ANIMALS AND LIVESTOCK	UGLY SCENERY	CHANCE TO SEE SCENERY	DAMAGING ANIMALS AND LIVESTOCK	UGLY SCENERY	CHANCE TO SEE SCENERY	DAMAGING ANIMALS AND LIVESTOCK
CROP SPRAYING	DIFFICULTY HEARING RADIO AND TV	HAVING DIFFICULTY THINKING	CROP SPRAYING	DIFFICULTY HEARING RADIO AND TV	HAVING DIFFICULTY THINKING	CROP SPRAYING	DIFFICULTY HEARING RADIO AND TV	HAVING DIFFICULTY THINKING
GETTING UPSET	DIRTY WATER FROM OIL SPILLS	USING UP PARKS AND PLAYGROUNDS	GETTING UPSET	DIRTY WATER FROM OIL SPILLS	USING UP PARKS AND PLAYGROUNDS	GETTING UPSET	DIRTY WATER FROM OIL SPILLS	USING UP PARKS AND PLAYGROUNDS
PLANTING SEEDS	FORCING PEOPLE TO MOVE	DIRTY LAUNDRY ON THE CLOTHESLINE	PLANTING SEEDS	FORCING PEOPLE TO MOVE	DIRTY LAUNDRY ON THE CLOTHESLINE	PLANTING SEEDS	FORCING PEOPLE TO MOVE	DIRTY LAUNDRY ON THE CLOTHESLINE

SPIRIT MASTER #2 FOR USE WITH ACTIVITIES # 3 and #11

SPIRIT MASTER #3: FOR USE WITH ACTIVITIES #6, #19, #25, and #26

Sample Scenarios

Louis Spontini and his family live near a large city airport. Airplanes carrying cargo land at all hours of the night and make it difficult for him to sleep. A new community group has just been formed to force the airport to shut down between 11:00 A.M. and 6:00 P.M. and Mr. Spontini is thinking of joining the group.

However, business people in the city say that if the airport closes down during the night, many businesses won't be able to get their goods on time or in good condition. Trains, buses, and trucks either take too long or are too expensive. These business people say they might have to close down if the airport is closed at night. This would mean many people would lose their jobs.

Should Mr. Spontini fight to close down the airport at night?

Sophi Goldberg lives in a pleasant part of San Fernando, a large city with its share of traffic and parking problems. She has to fight every day, in fact, to get from her home to work, a mile away. Then she has a problem finding a parking place when she gets home.

For some time now, she has been reading about plans for building a freeway a mile from where she lives. This freeway would help people who want to drive into and out of the city from the suburbs. The proposed location would go through part of a beautiful old park near her home. In addition, she feels that the freeway will bring more cars into the city, create more parking problems and more air pollution.

People who want the highway say that it will decrease travel time and cause less air pollution on local streets. City officials want the highway because it will encourage new industry to locate there and make it easier for people from the suburbs to shop in the downtown stores. The city needs the money from the people from the suburbs in sales taxes and purchases. Without a freeway, these people will go to the local shopping centers rather than travel by slow routes into the city.

Should Ms. Goldberg oppose the highway? Why?

Robert Hernandez lives in Littleville, a small town about forty miles from "the big city," North Neon. He likes his quiet countryside, free of air pollution and noise and lots of people.

However, he has just learned from the newspaper that the State Highway Department, with Federal assistance, plans to build a part of Interstate 44 just one mile outside of Littleville. In order to locate the highway there, a bridge will have to be built over the best trout-fishing stream in the county. Most important, the exit at Littleville threatens to change the town fro.. .. quiet rural village to a big suburb.

Continued...

People who want the highway say that users will save time by having a fast route across the county and there will be fewer accidents than on the slower, windy roads people have to use now.

Should Robert Hernandez oppose or support the highway? Why?

The state of Liveitup is holding its annual hearings on whether to outlaw or restrict highway advertising. Ron Smith is uncertain about what to do at the hearings. Business people argue that the signs are necessary to attract tourists to the places of recreation and to provide them with information about what events are taking place, where to eat, and where to find hotels and motels. The tourist trade appears to reduce taxes on residents because of the money the tourists spend. In addition, the tourist business provides jobs for many people in the state.

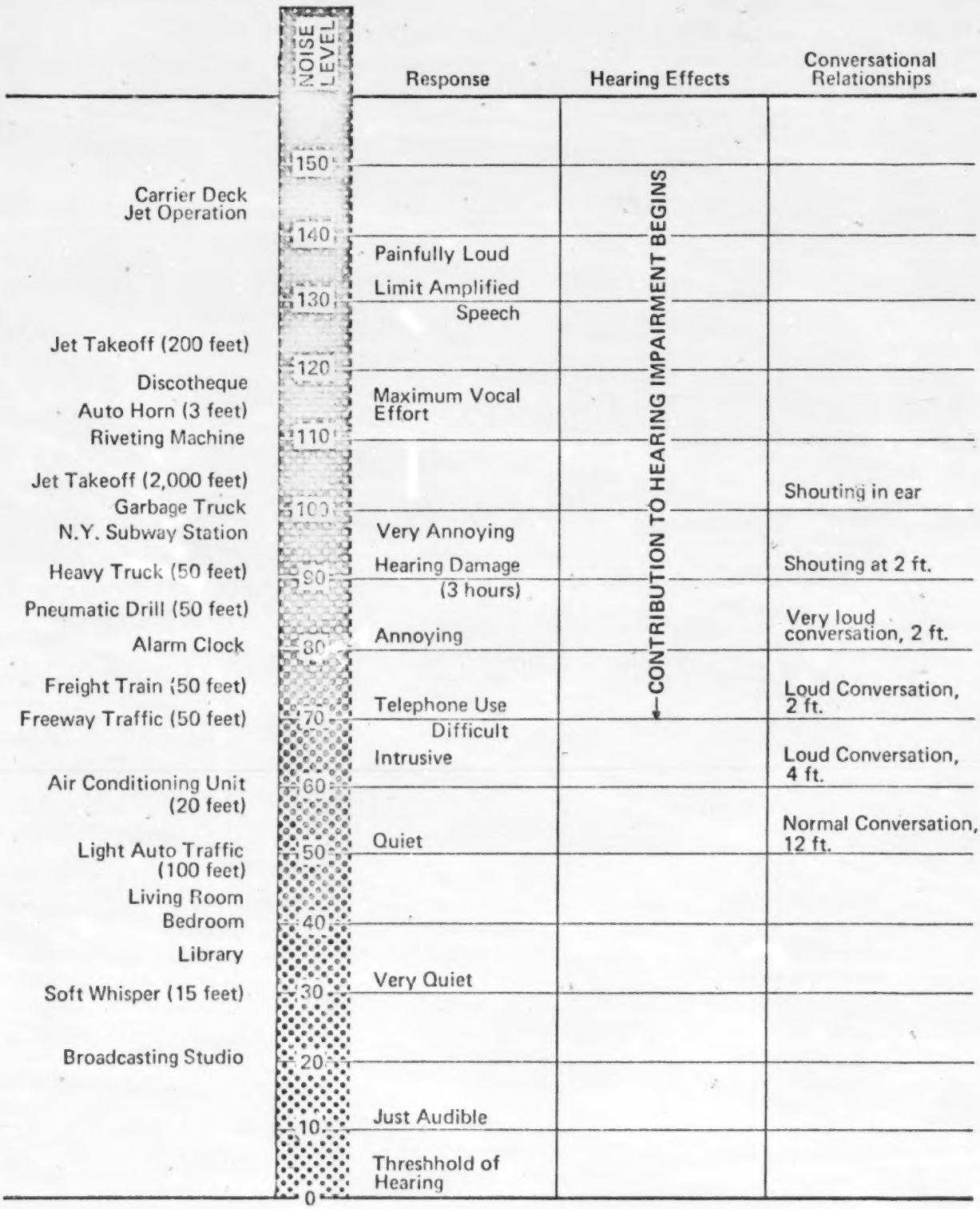
On the other hand, the signs sometimes cause accidents by distracting driviers from their driving tasks and, in addition, are an eyesore to many residents and tourists alike.

Ron Smith has another concern in this matter. He is only 14 years old and is not certain whether he will be allowed to attend the hearing and, if he is, whether he will be allowed to have his say. However, he feels strongly that he is affected by advertising as much as adults are. He also believes he should be able to influence the course of events since the decision to allow advertising could affect his chances of getting a job nearby when he is older and how much he will have to pay in taxes.

Should Ron be allowed to attend the hearing? If so, should he support a ban or restriction on roadside advertisements?

Sound Levels and Human Response

SPIRIT MASTER #4:
FOR USE WITH ACTIVITY #9



Source: *Noise Pollution*, U.S. Environmental Protection Agency, Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

SPIRIT MASTER #5: FOR USE WITH ACTIVITY #14

Instructions to Students

Imagine that you were flying from London to Australia last year and your plane crashed in the wilderness. You survived the crash and found your way to a large city in some foreign land. You were taken to a hospital, treated, and released. While waiting for the next stage-coach to take you over the mountains, you thought about something you had been struck by the moment you crashed in the country: there were no cars. Everyone traveled around by horseback, bicycle, and on foot. You said to yourself, "If I could interest a car dealer in the U.S. to sell cars here, we could make a fortune."

Much later, you were indeed able to persuade a car company to agree to sell small cars to Smogfree, the country you had crashed into. So the company sent you back to Smogfree to persuade the rulers to allow cars to be introduced. After some negotiations, Smogfree agreed to let cars be introduced, but on one condition. You had to become Minister of Automobiles in Smogfree and make sure that the country was ready to handle cars before any cars actually arrived.

The rulers of Smogfree are now giving you a free hand to do whatever needs to be done to get the country prepared for and able to handle a large number of cars. But these rulers have let you know that if the cars create any serious problems, you will be executed. You decide to stay and make your fortune.

You are now sitting down to plan what needs to be built and created in Smogfree to make it easy for the capital city and the rest of the country to accommodate cars.

What do you need to build in Smogfree to handle cars? What problems will cars create that you should plan for now?

SPIRIT MASTER #6: FOR USE WITH ACTIVITY #22

Sample Instructions to Students

Read the following paragraph, which is *not* a true story, and answer the questions at the end of it as honestly as possible. Pretend you are 25 years old and own a car.

The energy and pollution crises have become worse, the President announced on a special television broadcast to the nation yesterday. As a result, he is asking citizens to voluntarily give up driving their cars on Sundays except for essential purposes, such as going to work or to the hospital. However, he is not asking for laws to prohibit Sunday travel; he wants citizens to agree voluntarily. He encouraged citizens to make greater use of bicycles, walking, and public transportation.

Tomorrow is the first Sunday since the President's speech. However, Sunday has been a very good day for you to visit relatives and attend sporting events, and you had planned to do both tomorrow. You know that there will be enough drivers on the road going to jobs, engaged in other essential tasks, and ignoring the President's recommendations so that you could probably drive too and not be noticed. Will you, then, follow the President's request? (Check answer below.)

Yes: _____ No: _____ Unsure: _____

If you said Yes, *why* will you abide by the President's request? If you said No or Unsure, or said Yes, but only reluctantly, why are you unwilling or reluctant to conform to the President's request? (Write reasons below.)

SPIRIT MASTER #7: FOR USE WITH ACTIVITY #23

Sample Scenarios

Every morning in winter, Mr. Jackson runs out of the house, starts his car, and runs back into the house for breakfast, leaving the engine running. He does this to get the heater working and to keep the engine from stalling when he drives away. However, for five or ten minutes his exhaust system gives off gas fumes that collect around his neighbors' house, Mr. and Mrs. Jones. The Joneses feel that this is very unhealthy and it wastes gas.

Do Mr. and Mrs. Jones have the right to complain to Mr. Jackson? Why?

Phil is the fourteen-year-old son of Mr. O'Connor. The family lives in the city, and Phil's father works twelve miles away in a factory. Every day Mr. O'Connor drives to work by himself even though there are a few other people in the neighborhood who work at the same plant and ride there together in a carpool.

Phil thinks his father should join the carpool to save gas, not pollute the environment so much, and, for that matter, save money too. Mr. O'Connor says he wants to be able to stop off on the way home from work for errands and "can't stand" one of the workers in the carpool.

Does Phil have the right to discuss the issue further with his father? Why?